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## Assessing quality of Interdisciplinary rounds in the intensive care unit

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### *Document Version*

Publisher's PDF, also known as Version of record

### *Publication date:*

2014

[Link to publication in University of Groningen/UMCG research database](#)

### *Citation for published version (APA):*

ten Have, E. (2014). *Assessing quality of Interdisciplinary rounds in the intensive care unit*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.

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**ASSESSING THE QUALITY OF INTERDISCIPLINARY ROUNDS  
IN THE INTENSIVE CARE UNIT**

**ELSBETH C.M. TEN HAVE**

Voor pa en ma, die razend trots zouden zijn geweest

The publication of this thesis was financially supported by:

University of Groningen

Fysiotherapie “Yn ‘t Doarp’

iMDsoft

Cover: Design by Bonno Blaauw

Printed by Gildeprint Drukkerijen

ISBN (printed version): 978-90-367-6900-6

ISBN (e-version): 978-90-367-6901-3

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## **ASSESSING THE QUALITY OF INTERDISCIPLINARY ROUNDS IN THE INTENSIVE CARE UNIT**

### **Proefschrift**

ter verkrijging van de graad van doctor aan de  
Rijksuniversiteit Groningen  
op gezag van de  
rector magnificus prof. dr. E. Sterken  
en volgens besluit van het College van Promoties.

De openbare verdediging zal plaatsvinden op

woensdag 28 mei 2014 om 11.00 uur

door

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geboren op 21 november 1962  
te Delft

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*“Given that each profession within the ICU has a unique perspective and professional culture and that clinical disciplines train separately, it is understandable why miscommunication is common and a major contributor of medical errors”.*

Quote from B.D. Winters et al; Reducing diagnostic errors: another role for checklists? Acad Med 2011; 86: 279-81.





# Chapter 1

## General Introduction

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## INTERDISCIPLINARY ROUNDS IN THE INTENSIVE CARE UNIT

More than 76,000 intensive care unit (ICU) admissions occur annually in the Netherlands.<sup>1</sup> The ICU is characterized by life-threatening and time-critical conditions which require the synchronized and collaborative efforts of different professionals working together as an effective interdisciplinary team.<sup>2</sup> Recent studies concerning optimal team ICU care mention the importance of interdisciplinary rounds (IDRs) in the ICU.<sup>3</sup> Daily IDRs are associated with improved outcome of medical ICU patients, reductions in preventable harm, as well as fewer conflicts between ICU team members.<sup>3-9</sup> Therefore, daily IDRs are endorsed by the Society of Critical Care Medicine.<sup>3</sup> In addition, in the Netherlands, the Dutch ICU Society describes an IDR as a quality indicator (kwaliteitsvisitatie, NKIC 2008).

IDRs are meetings in which health care professionals from different disciplines collaborate to develop an integrated plan of care for an individual patient.<sup>10</sup> The goal is to increase the quality of patient care by sharing information, addressing patient problems, and planning and evaluating treatment.<sup>10</sup> Although there is no ambiguity about the goal of the IDR, the execution varies because IDRs are complicated by factors like limited time, multiple targets, patient instability, highly technical therapies, and varying responsibilities of different care providers.<sup>5,10-12</sup> Literature about well-performed IDRs is scarce. The available literature focusses more on divergent perceptions between doctors and nurses regarding status/authority, gender, training, and patient care responsibilities than typical characteristics of well-performed IDRs. We feel there is a need for studies that generate answers to questions like:

1. What are the characteristics of well-performed IDRs?
2. How do we assess the quality of IDRs?
3. How do we improve the performance of IDRs?

There are no uniform methods nor published reports about assessing and improving quality of IDRs available and there is no clear definition of IDR. As a result of this we think that IDRs are not effectively utilized in daily practice.

## LITERATURE SEARCH

Research about IDRs is scarce and difficult to comprehend, owing to the use of ill-defined concepts, such as collaboration, interdisciplinary communication, and teamwork.<sup>14-16</sup> Evidence from survey studies in health care highlight the differences between doctors and nurses, while studies from organisational psychology emphasize the “awareness of goals” and “awareness of how to achieve them”.<sup>17,18</sup>

To our knowledge there is no quantitative evidence supporting associations between aspects of IDRs (such as communication, coordination and decision making) and improved outcomes (such as reduced length of stay, reduced morbidity and mortality or increased job satisfaction).<sup>8,19</sup>

The purpose of our literature search is to categorize and appraise quantitative studies investigating associations between aspects of an IDR and improved outcomes, which will allow us to determine the key characteristics of well performed IDRs in modern ICUs.

A structured narrative literature search was performed to answer the following questions:

- Which outcomes are reported regarding interdisciplinary communication in the intensive care unit?
- Which outcomes are empirically tested and improved?

Therefore, a search approach of the bibliographic databases PubMed and ISI Web of Science was conducted with the assistance of a library science specialist complemented with snowball sampling of the existing literature.<sup>14</sup> The articles had to be published in English during the period January 1995 through December 2011.

The search terms were based on the Intensive Care Unit Team Performance Framework of T.W. Reader and the Goals, Roles, Processes, and Interpersonal Relationships (GRPI) model of Rubin, Plovnick, and Fry (1977).<sup>8,20</sup> We used the following search terms which were related to the ICU, aspects of rounds, and aspects of communication, namely: (ICU OR intensive care OR critical care) AND (goal\* OR coordination OR leadership OR decision-making OR round\*) AND (multidisciplinary communication OR teamwork OR collaboration OR interdisciplinary communication NOT "Communication"[Mesh:noexp]).

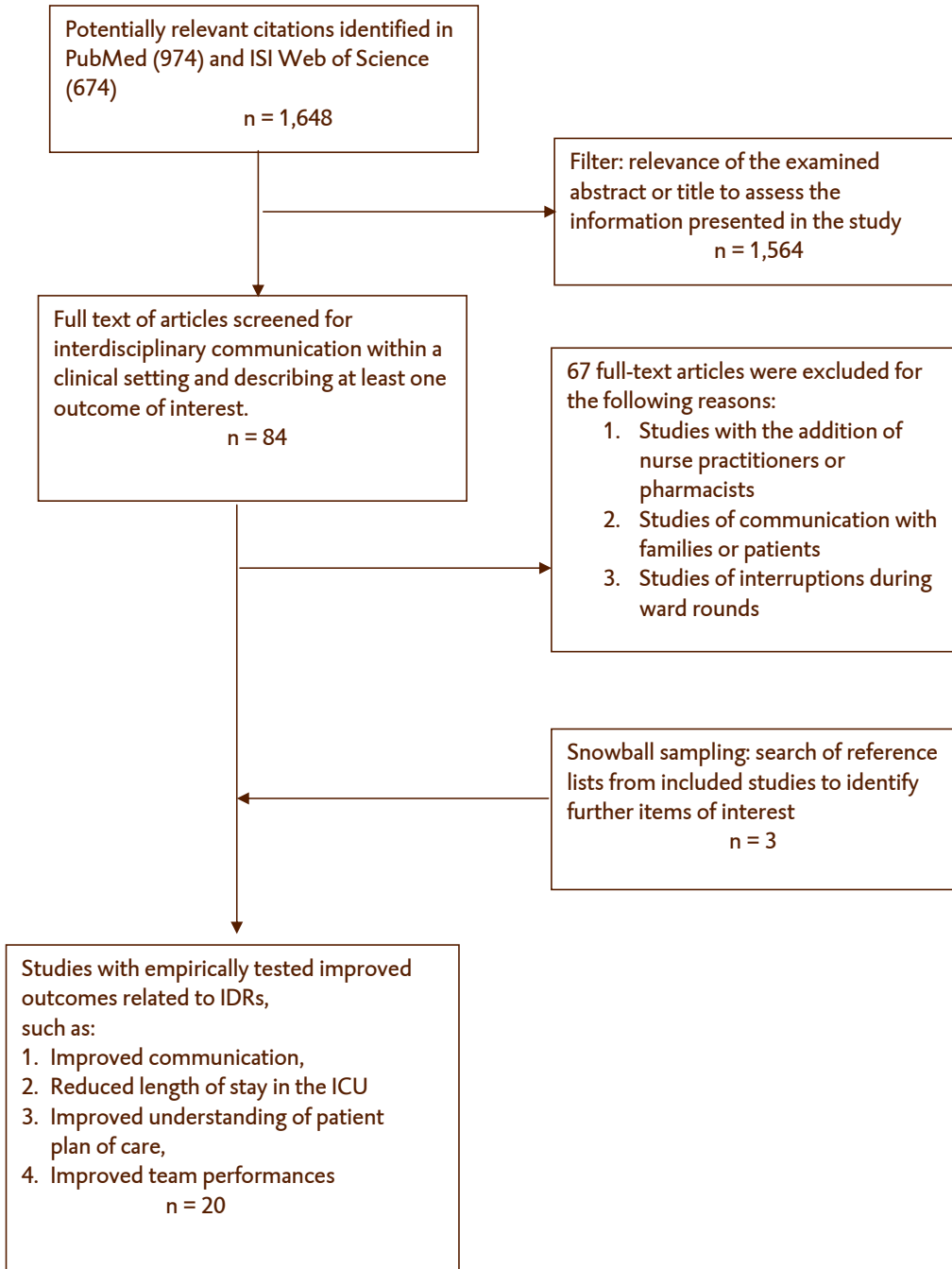
The search identified 1,648 articles. These articles were screened for relevance on the basis of titles and abstracts (see Figure 1). The articles were excluded from the final selection if they did not investigate the relationship between team performance and outcomes, but focused on topics less relevant to our investigation, such as the addition of nurse practitioners or pharmacists, interruptions during ward rounds, or studies regarding communication with families or patients.

The remaining articles ( $n = 84$ ) were each read in their entirety in order to find papers that investigated aspects of communication and collaboration within a clinical setting and related this to an improved outcome.

Articles were included if they provided empirical information on the relation between team processes and outcomes to patients or ICU care professionals, such as improved communication, reduced length of stay in the ICU, improved understanding of patient plan of care, or improved team performance. Snowball sampling of the reference lists of the filtered articles ( $n = 18$ ) identified three additional articles.<sup>14</sup>

The 20 remaining studies relevant to aspects of IDRs were all published in medical, nursing or multidisciplinary peer-reviewed journals. Of these 20 studies, 9 took place in adult ICUs, 4 in paediatric ICUs, 2 in neonatal ICUs, and 5 in acute medical settings.

Figure 1. Results of the search strategy. ICU, Intensive Care Unit; IDR, interdisciplinary rounds.



Empirically tested improved outcomes, as described in the 20 studies, were each connected with one of the following key characteristics: 1) daily patient goals, 2) open communication focussed on understanding goals, 3) strong leadership behaviour, and 4) the use of checklists.

Although these key characteristics are narrowly related to each other, each characteristic is discussed separately.

### Goals

The interdisciplinary focus on discussing daily patient goals led to a reduced length of stay for patients in adult ICUs, as described by Pronovost et al. (2003).<sup>5</sup> The results were confirmed by other comparative studies in (paediatric) ICUs.<sup>12,21-23</sup>

Goals refer to both clinical outcomes and important measurable processes concerned with the delivery of efficient care and are especially important in interdisciplinary as opposed to unidisciplinary rounds.<sup>12,24</sup> In short, daily patient goal discussion is characterized by “what work needs to be accomplished to get this patient to the next level of care”.<sup>5</sup>

From the perspective of the team process, a focus on goals improved the ability of team members to work in a coordinated and collaborative manner. This was investigated in two intervention studies in neonatal ICUs showing that unifying goals might be helpful in removing the traditional hierarchical barriers between nurses and physicians.<sup>25,26</sup> It was stated that an optimal team process focuses more on collaborative effort rather than individual achievement.<sup>25,26</sup>

### Communication

An association between the quality of communication and patient outcomes has been repeatedly demonstrated by incident and adverse event analysis.<sup>6,7,16,23,27,28</sup> Based on this conclusion, intervention studies have been undertaken, aimed at countering this problem. Five intervention studies in (paediatric) ICUs highlighted that when team members *understood* the daily patient goals better, patients' length of stay in the ICU decreased.<sup>5,12,21-23</sup> Some papers showed that the degree to which team members acknowledge the understanding of patient care goals depends on perceived quality of

*communication and openness* in the team.<sup>6,29</sup> In general, open communication is associated with information sharing amongst the team's members.<sup>15</sup>

Although communication is considered to be an important trait, it is noteworthy that the characteristics of good communication along with serious attempts (in the literature) to enhance communication processes to improve patient outcome, are rarely defined.

From the perspective of the team process, methodologically differently designed studies described that open communication by seeking and valuing contributions from ICU team members, and in particular listening to trainee and nurse concerns, was not only associated with a decrease in adverse events, but also created a culture that encouraged nurses.<sup>30-32</sup>

### Leadership

Strong leadership behaviour demonstrated by senior physicians or leading intensivists focused on an open atmosphere and support for team members by defining boundaries and expectations. It contributed significantly to improved patient outcomes, such as reduced length of stay.<sup>12,26,28</sup>

Leadership was defined as “the process of influencing others to understand and agree about what needs to be done and how to do it, and facilitating individual and collective efforts to accomplish shared objectives”.<sup>33</sup>

Strong leadership may also support the *decision-making* process by encouraging contributions from both trainee and nurse because this was associated with a decrease in adverse events.<sup>31,32,34,35</sup>

From the perspective of the team process, leadership included a clear understanding of joint responsibilities, along with continuous active cross-checking, to prevent key activities from escaping attention. An intervention and survey study investigating team leadership in ICUs for adult patients revealed that the keys to a stable and safe environment are senior physicians working to develop a common perspective on the goals and expectations and establish a positive team culture.<sup>31,32</sup>

### Checklists

Checklists are considered to be useful to structure the interdisciplinary communication process in complex and dynamic situations in the ICU, such as IDRs, because they



provide clear guidelines which can otherwise be complicated by diversity of perceptions, educational backgrounds, and responsibilities of team members and consultants.<sup>5,36-38,39</sup>

Improved patient outcomes were found in 5 intervention studies in both paediatric and adult ICUs investigating checklists which included the patient daily goal. Examples of these improved patient outcomes were a reduced length of stay and an improved VAP and bloodstream infection rate.<sup>5,21,22,37,40</sup>

In regards to the team process, improved team performance during rounds were found in studies of paediatric and adult ICUs and were associated with the use of checklists.<sup>5,37</sup>

Our research of the literature reinforces the belief that: 1) the use of daily patient goals together with, 2) open communication to understand these patient goals, 3) strong leadership behavior, and 4) the use of checklists, comprise the key characteristics of well-performed IDRs in the ICU because these are associated with improved outcomes for the ICU patient and/or the ICU care providers.

### THESIS OUTLINE

Since IDRs are considered to be a useful approach for effective patient centered care by interdisciplinary teams in the ICUs we explored further studies. These studies investigated quality indicators to assess IDRs, the development of an assessment tool, and its application in a learning model and ‘real life’ as well.

This thesis contains:

1. Assessing the quality of IDRs (chapter 2)
2. The validation of a checklist to lead IDRs (chapter 3)
3. A leadership training aimed to improve the quality of IDRs (chapter 4)
4. Mutual agreement between ICU care providers about aspects of the patients’ care plan (chapter 5)
5. Assessing the care plan of the long-term ICU patient during IDRs (chapter 6)
6. IDRs as a strategy to improve ICU care (chapter 7)

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## CHAPTER 2

# ASSESSING THE QUALITY OF INTERDISCIPLINARY ROUNDS IN THE INTENSIVE CARE UNIT

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*Journal of Critical Care 2013;28:476-482.*



### ABSTRACT

**Purpose:** Interdisciplinary rounds (IDRs) in the intensive care unit (ICU) are increasingly recommended to support quality improvement, but uncertainty exists about assessing the quality of IDRs. We developed, tested, and applied an instrument to assess the quality of IDRs in ICUs.

**Materials and Methods:** Delphi rounds were done to analyze videotaped patient presentations and elaborated together with previous literature search. The IDR Assessment Scale was developed, statistically tested, and applied to 98 videotaped patient presentations during 22 IDRs in 3 ICUs for adults in 2 hospitals in Groningen, The Netherlands.

**Results:** The IDR Assessment Scale had 19 quality indicators, subdivided in 2 domains: “patient plan of care” and “process.” Indicators were “essential” or “supportive.” The interrater reliability of 9 videotaped patient presentations among at least 3 raters was satisfactory ( $\kappa = 0.85$ ). The overall item score correlations between 3 raters were excellent ( $r = 0.80-0.94$ ). Internal consistency in 98 videotaped patient presentations was acceptable ( $\alpha = .78$ ). Application to IDRs demonstrated that indicators could be unambiguously rated.

**Conclusions:** The quality of IDRs in the ICU can be reliably assessed for patient plan of care and process with the IDR Assessment Scale

**KEYWORDS:** Critical care; Process assessment; Videotape recording; Quality indicators; Interdisciplinary communication

## INTRODUCTION

Interdisciplinary rounds (IDRs) are meetings in which health care professionals from different disciplines collaborate to develop an integrated plan of care for the individual patient.<sup>1</sup> The goal is to increase the quality of patient care by sharing information, addressing patient problems, and planning and evaluating treatment.<sup>2</sup> In the intensive care unit (ICU), IDRs are recommended to support quality improvement and to reduce preventable patient harm and conflicts.<sup>1,2</sup> This recommendation was initiated by evidence that ineffective interdisciplinary communication among medical teams is a leading cause of preventable patient harm and a source of severe conflicts within ICUs.<sup>3-5</sup>

Although there is no ambiguity about the goal of the IDR, the execution varies because IDRs are complicated by factors including limited time, multiple targets, patient instability, highly technical therapies, and varied responsibilities of different care professionals.<sup>6-8</sup> However, there are neither uniform methods nor published reports to assess the quality of IDRs. Well qualified IDRs are considered to be rounds in which the appropriate plan of care is agreed to, understood, and executed as planned by all care professionals.<sup>8,9</sup>

Studies that have investigated IDRs have emphasized that several attributes (i.e. the use of checklists, understanding daily patient goals) and key behaviors (i.e. effective coordination to support task and information management, strong leadership behavior focused on an open atmosphere, and support for team members by defining boundaries and expectations) are essential to execute well-qualified IDRs in the ICU.<sup>8,10-12</sup> The synthesis of these studies may provide valuable information but does not provide a validated assessment instrument. An assessment instrument aimed at the quality of the IDR would be consistent with patient safety measurements that provide a more comprehensive measure of the safety and quality within the ICU.<sup>2,13-15</sup>

The purpose of this study is to develop, test and apply an assessment instrument to measure the quality of IDRs in ICUs.

## MATERIAL AND METHODS

### Tool development

Tool development was established in 4 consecutive steps namely 1) criteria for assessments instruments; 2) Delphi Rounds combined with previous literature search, 3) application of the instrument and 4) data and statistical analysis. These steps are discussed in the sections below.

### Criteria for assessment instruments

A literature search was done that identified 2 different types of criteria for instruments about assessing team processes in the ICU. The first type of criteria referred to investigations about patient safety, such as reducing the incidence of central line infections by using checklists for catheter insertion and maintenance.<sup>16</sup>

Instruments to improve patient safety in the ICU were based on findings from the aviation industry and Formula 1 racing teams because of the long history of measuring and improving teamwork to prevent and mitigate errors.<sup>17,18</sup> The second type of criteria referred to team and patient care processes in ICUs, such as the social-professional structure of complex interdisciplinary organizations.<sup>19</sup> Eight criteria revealed by this second type were used to develop the assessment instrument for evaluating the quality of IDRs (Table 1).<sup>13,20-23</sup>

*Table 1. Criteria for Assessment Instruments Identified in a Literature Search \**

1. Measures both the patient plan of care (technical performance) and team processes<sup>18</sup>
2. Based on literature review and associated with improved outcomes<sup>22</sup>
3. Capable of measuring multiple patients with multiple conditions<sup>3</sup>
4. Fosters an interdisciplinary approach<sup>8</sup>
5. Describes each quality indicator in terms of observable behavior<sup>17</sup>
6. Capable of measuring the effectiveness of different aims and approaches of the IDR in the ICU<sup>21</sup>
7. Capable of measuring interventions for improvement related to the IDR (before and after test)<sup>18</sup>
8. Indicators are statistically tested<sup>22</sup>

\* References for each criterion are noted.

The first criterion was satisfied by including 2 domains in the instrument: (1) “patient plan of care,” to reflect the technical performance from the initial identification of a goal to the evaluative phase, and (2) “process,” to reflect the team processes that are important to ensure that the appropriate plan of care is agreed, understood, and executed as planned by all care professionals (see Table 2). The second criterion (“based on literature review and associated with improved outcomes”) was satisfied by the literature review. For the third criterion (“measuring multiple patients with multiple conditions”), choices were made to score the quality of each discussed patient plan of care during the IDR, because the execution and team compositions of IDRs may differ between ICUs.<sup>6-8,11</sup> Therefore, the assessment was concentrated on the patient level. It was possible to score the leading intensivist while discussing several patient plans of care to assess the IDRs by several intensivists at a time.

To satisfy the fourth criterion (“fosters an interdisciplinary approach”), quality indicators to assess different professions were included. The construction of this assessment instrument allowed enlargement for additional specialist consultants. The fifth criterion (“describes each quality indicator in terms of observable behavior”) was processed in the description of the quality indicators. Observable behaviors were defined as observable, nontechnical behaviors that contributed to performance within the work environment. To evaluate the sixth criterion (“capable of measuring the effectiveness of different aims and approaches of the IDR in the ICU”), the instrument was tested in 3 ICUs for adults in 2 different hospitals that used different procedures for IDRs; all indicators could be unambiguously rated. To satisfy the seventh criterion (“capable of measuring interventions for improvement related to the IDR [before and after test]”), an intervention was conducted with before and after measurement. This non-randomized intervention study measured control and intervention groups after leadership training with this instrument and was reported in detail elsewhere.<sup>28</sup> Statistical testing was applied to satisfy the eighth criterion.

### Delphi rounds

To develop quality indicators for assessing IDRs, Delphi rounds were organized which consisted of 2 intensivists, 2 psychologists, 1 ICU manager, 2 ICU nurses, and the first author (E.T.H.). Delphi rounds have been used in initial research about topics with little

or no previous research, may help build a theoretical foundation for the issue being studied, and may provide the details for developing instruments.<sup>18</sup>

During the Delphi rounds, 10 patient presentations were carefully analyzed that were videotaped during IDRs led by different intensivists in 2 ICUs for adults in a university medical center. Appropriate and inappropriate behaviors were highlighted. These findings were compared with previous literature search in which attributes and key behaviors were extracted if the text provided empirical information on improved outcomes to patients or ICU professionals which were related to or able to be applied to an IDR in the ICU.<sup>8,10-12</sup> These attributes and key behaviors were already described in the introduction section.

Synthesis of this review showed 4 common themes: technical performance (including goals), communication with caregivers in different disciplines, coordination of the different disciplines, and the division into essential and supporting indicators. Further analysis identified descriptive elements for each indicator. During 3 consecutive sessions, indicators and their descriptive elements were revised during the analysis of the 10 different videotaped presentations and prepared for use in the IDR Assessment Scale instrument.

### The application of the instrument

To test the application of the IDR Assessment Scale, this instrument was applied to 98 videotaped patient presentations during 22 IDRs in 3 ICUs for adults, led by 14 different intensivists during June 2009 and December 2010. Two ICUs (1 medical and 1 surgical) were located in a university medical center for intensive care and had combined approximately 1500 patients admitted per year. The other general ICU, located in a university-affiliated teaching hospital, had approximately 600 patients admitted per year. In both hospitals, daily IDRs were organized separate from morning rounds and reports at changes of shifts. During these IDRs, the intensivists led the sessions; junior physicians gave clinical patient presentations; and bedside nurses and consultants gave additional relevant and current information.

In all 3 ICUs, IDRs started at 11:00 a.m. Before the IDR started, the video camera was placed in the corner of the meeting room to enable rating of all participants. At the end of the IDR, the video camera was removed. One of the raters stayed during the IDR in the same meeting room to rate the performance of each participant. The planning of

videotaping the IDRs was tailored to the shifts of the leading intensivists to enable the rating of different participants.

All participants gave formal approval for the videotaping of IDRs. The Medical Ethical Testing Committee of the University of Groningen waived Institutional Research Board approval for videotaping IDRs in the ICUs.

The usability and face validity of the instrument were examined by determining the amount of training time necessary to instruct another intensivist and ICU nurse about the appropriate use of the instrument. Both ICU care professionals volunteered for this study. An instrument manual was prepared, and it was explained to the intensivist and nurse by trainers with both a communication and medical background; 1 videotaped patient presentation was rated to check whether definitions were applied uniformly. Then, another 2 patient presentations were randomly selected and rated separately. The results were compared and the training was defined as adequate when  $\kappa > 70\%$ . The amount of training time necessary to instruct another intensivist and ICU nurse to use this instrument adequately was approximately 1.5 hours.

#### Statistical analysis

Of the 108 videotaped patient presentations, 10 patient presentations were used during the Delphi rounds to determine the quality indicators and were excluded from further statistical analysis. Of the remaining 98 patient presentations, 9 randomly selected videotaped patient presentations were used to test the interrater reliability of the quality indicators by 3 raters. These 3 raters including 1 intensivist, 1 ICU nurse, and 1 author (E.T.H.). An online multirater Cohen kappa calculator was used to assess outcomes per quality indicator for the 3 raters of each patient presentation.<sup>24</sup> Adequate interrater agreement was defined by  $\kappa \geq 0.70$ .<sup>25,26</sup> Because the interrater agreement was more than adequate, the remaining 89 patient presentations were further tested by 1 of these 3 raters. To diminish bias due to the fact that the developed methods created a shared understanding, another 26 of the in total 98 patient presentations were corroborated by an additional independent non-medical rater.

The intraclass correlation was examined by measuring the average score correlation between pairs of raters (1 intensivist [rater 1]; 1 author [E.T.H., rater 2]; and 1 ICU nurse [rater 3]). Pearson correlation coefficients ( $r$ ) were determined.

Internal consistency was measured for 98 videotaped patient presentations with Cronbach alpha ( $\alpha$ ). Internal consistency ranged from 0 to 1. Acceptable reliability was defined by  $\alpha = 0.6$  to  $0.7$ , and good reliability was defined by  $\alpha \geq 0.8$ .<sup>25</sup>

A confirmatory factor analysis was conducted on the indicators using principal components extraction with Varimax rotation to confirm the subdividing into essential and supportive indicators by the Delphi rounds.<sup>27</sup> As a criterion, a cut-off point of  $0.6$  was used for indicators in the rotated factor loading matrix.

The application of the instrument was tested by measuring the presence of quality indicators during IDRs in 3 ICUs.

## RESULTS

### Interdisciplinary Round Assessment Scale

To assess the quality of the IDRs, the IDR Assessment Scale was constructed with 19 quality indicators that were based on literature review and Delphi rounds (Table 2). The scale was subdivided into the 2 domains: “patient plan of care” and “process”. The first domain included 8 quality indicators, and the main and secondary problems were distinguished by Delphi rounds. The ICU patient may have multiple secondary problems, so it was deemed relevant to assess whether the discussion about secondary problems does not adversely affect the discussion of the main problem. Of these 8 indicators, 5 were qualified as essential indicators by both Delphi rounds and factor analysis (Table 2).

The “process” domain had 11 quality indicators, including 3 that were added by Delphi rounds. The indicator “junior physician asks for advice” was added because IDRs may be important learning opportunities. The indicator “ICU nurse acts proactively and assertively” was added because the nurse’s performance was important in influencing the discussion of the patient plan of care. The indicator “summary given” was necessary because of the complexity of the discussed plans of care. Of these 11 indicators, another 5 were qualified as essential indicators by both Delphi rounds and factor analysis (Table 2). The assessment of leadership behavior was included implicitly and not as a separate item, because leadership behavior may be important to interdisciplinary teams in providing coordinated and safe patient care.

All 19 quality indicators were described in terms of observable behavior that was explained in the manual, which was necessary for use of this assessment instrument.

The raters qualified their observations with the definition of the quality indicator using a 3-point scale indicating whether the behavior occurred during each individual patient presentation:<sup>29</sup>

1. No. The behavior was not observed.
2. Doubt/inconsistent. Verbalizations or behaviors were inconsistent with the quality indicator.

3. Yes. The behavior was clearly observed and consistent with the quality indicator. Some items had a “not applicable” option if the indicator could not be rated. For an optimally executed IDR, all 10 essential indicators were rated with “yes” or “not applicable” (Table 2).

### Application of the instrument

Applying the IDR Assessment Scale to 98 ICU patient presentations showed that the frequency of discussing the main problem, diagnostic plan and (provisional) goal differed per ICU (Table 2). The quality indicators as the expectations by the consultant were made clear and input of nurses was encouraged, was often affirmative rated in most IDRs in all 3 ICUs. The quality indicators like long term intervention discussed, it is clear who is responsible for performing tasks and indicators about the junior physicians were less discussed. All indicators could be unambiguous rated.



*Table 2. Application of the Interdisciplinary Round Assessment Scale in Clinical Scenarios in 3 Intensive Care Units.\**

		ICU* 1 (medical) 46 patients; 5 rounds; 5 int.**	ICU 2 (surgical) 23 patients, 3 rounds, 3 int.	ICU 3 (general); 29 patients; 14 rounds; 6 int.
	<b>PATIENT PLAN OF CARE</b>	<b>Number (percentage)</b>	<b>Number (percentage)</b>	<b>Number (percentage)</b>
1.	<b>Main problem discussed</b>	<b>24 (52)</b>	<b>17 (74)</b>	<b>29 (100)</b>
2.	<b>Diagnostic plan discussed</b>	<b>31 (67)</b>	<b>22 (96)</b>	<b>29 (100)</b>
3.	<b>The (provisional) goal formulated</b>	<b>18 (39)</b>	<b>18 (78)</b>	<b>29 (100)</b>
4.	<b>Long-term interventions (<math>\geq</math> 16 h) discussed</b>	<b>16 (35)</b>	<b>8 (35)</b>	<b>7 (24)</b>
5.	<b>Patient greatest risk discussed</b>	<b>23 (50)</b>	<b>5 (22)</b>	<b>22 (75)</b>
6.	Secondary problems discussed	44 (96)	22 (96)	25 (86)
7.	Plan of care for secondary problems discussed	36 (78)	22 (96)	23 (79)
8.	Short-term (< 16 h) interventions discussed	45 (98)	22 (96)	28 (97)
	<b>PROCESS</b>			
9.	<b>Expectations made clear by consultants</b>	<b>41 (89)</b>	<b>23 (100)</b>	<b>27 (93)</b>
10.	<b>Input of junior physicians encouraged</b>	<b>19 (41)</b>	<b>16 (70)</b>	<b>21 (72)</b>
11.	Are there questions for junior physicians?	29 (63)	15 (65)	22 (76)
12.	Junior physician asks for advice/information	4 (9)	3 (13)	2 (7)
13.	Leader checks whether junior physician knows what to do according to patient plan of care	1 (2)	3 (13)	4 (14)
14.	<b>Input of nurses encouraged</b>	<b>39 (85)</b>	<b>23 (100)</b>	<b>22 (76)</b>
15.	Are there questions for nurse?	42 (91)	23 (100)	23 (79)
16.	ICU nurse acts proactively and assertively about patient plan of care	31 (67)	12 (52)	4 (14)
17.	Leader checks whether the nurse knows what to do according to patient plan of care	31 (67)	12 (52)	4 (14)
18.	<b>Summary given</b>	<b>16 (35)</b>	<b>15 (65)</b>	<b>26 (90)</b>
19.	<b>It is clear who is responsible for performing tasks</b>	<b>10 (22)</b>	<b>2 (9)</b>	<b>14 (48)</b>

\*ICU, intensive care unit. \*\*Int, intensivist. The sum of ICU 1, 2, and 3 is 98 patient presentations.

Interdisciplinary Rounds Assessment Scale: each item was answered with either 1 (no), 2 (doubt) or 3 (yes). Some indicators had the "not applicable option"; however this did not apply to scale items 1, 3, 18, and 19. Data are reported as "number (%) of the yes-rating" (responses of no, doubt, and not applicable are not shown). Essential indicators revealed by factor analysis are in bold text.

### Statistical analysis

The interrater reliability of the IDR Assessment Scale among the 3 raters showed adequate agreement ( $\kappa = 0.85$ ). The interrater reliability among the 4<sup>th</sup> rater who rated at random 26 of the 98 patient presentations also showed adequate agreement ( $\kappa = 0.82$ ). The variable number of raters did not affect the inter-rater values.

Intraclass correlation coefficient (0.72) showed fair reproducibility between the observers. The overall item score correlations between 3 raters were excellent. There was a significant correlation between rater 1 (intensivist) and rater 2 (first author) ( $r = 0.83$ ;  $P < .0001$ ); rater 1 (intensivist) and rater 3 (ICU nurse) ( $r = 0.8$ ;  $P < .000$ ); and rater 2 (first author) and rater 3 (ICU nurse) ( $r = 0.94$ ;  $P < .0001$ ). Internal consistency was acceptable ( $\alpha$ , 0.78).

Factor analysis confirmed the solution by the Delphi rounds of the essential indicators within the first domain on a cut-off point of 0.6 for indicators in the rotated factor loading matrix (Table 3). The instrument demonstrated face validity.

*Table 3. Factor Analysis Results: Essential Indicators for Which Criteria with a Rating of "Yes" Would be Expected*

Quality indicator	First domain of the factor analysis (factor loadings)
1. Main problem discussed	0.917
2. Diagnostic plan discussed	0.897
3. Provisional goal formulated	0.897
4. Long-term therapeutic items (16 h) discussed	0.797
5. Patient greatest risk discussed	0.668
9. Expectations made clear by consultants	0.762
10. Input of junior physicians encouraged	0.710
14. Input of nurses encouraged	0.732
18. Summary given	0.867
19. It is clear who is responsible for performing tasks	0.710

\* Comprised by the first domain of the factor analysis from the Interdisciplinary Rounds Assessment Scale (IDR-Assessment Scale)

## DISCUSSION

Interdisciplinary rounds are important to support quality improvement in patient care. However, IDRs are time- and cost consuming and no instrument is available in previous research to assess their quality. The present study describes the development and application of an IDR Assessment Scale with 19 quality indicators, subdivided in 10 essential and 9 supportive indicators and in 2 domains (“patient plan of care” and “process”), important to assess the quality of an IDR.

Our assessment instrument provides feedback on the process and aim of the IDRs namely to increase quality of patient care by sharing information, addressing patient problems, and planning and evaluating treatment. Furthermore, the evaluation of this feedback may depend on the IDR goals as determined by the ICU staff.

Our study with videotaped patient presentations, focused on observable behavior during the IDRs, in contrast with other studies that had been predominantly done with self-report surveys. A strength of the use of an assessment instrument is the identification of issues that are not immediately obvious to participating ICU staff. Issues such as “goal formulated,” “summary given,” or “clarity in coordination” may not be easily detected by self report studies. A second strength of the IDR Assessment Scale is that it integrates both technical performance (“patient plan of care” domain) and the communication and coordination aspects (“process” domain), whereas previous studies considered these domains separately. Finally, this assessment scale may evaluate the use of checklists aimed to structure the IDRs, because if these checklists contained elements that pose risks or that exclude important elements, they may be neither effective nor efficient at improving patient care.<sup>30</sup>

Limitations of the present study include the absence of any assessment of the scores for predictive value for any type of patient outcomes, such as length of stay or prevalence of catheter related bloodstream infections. A second limitation includes the awareness of being videotaped and this may have affected the discourse in IDR that was being evaluated. A second limitation includes the awareness of being videotaped and this may have affected the discourse in IDR that was being evaluated. However, participants were strictly informed about the purpose of this rating and their videotaped IDRs were not used for demonstration of any behavior. Participants declared, in personal communication with the author, to forget being videotaped after 1 patient presentation.

Furthermore, we studied only 3 ICUs in 2 hospitals in the same region in The Netherlands, and this may have limited the ability to generalize the present findings. Further testing of the general applicability of the IDR Assessment Scale is necessary because there may be relevant structural differences between ICUs, such as staffing level and open versus closed unit type, units with teaching obligations, and rounds being held in crowded hallways or quiet rooms. The sometimes sub-optimal circumstances, in which IDRs can take place, may generate more difficulties in observing behaviors. However, the construction of the IDR Assessment Scale on the patient level may limit the differences in which ICUs may evaluate IDRs.

In general, ICU staff's aim for daily optimal quality of care and daily IDR is regarded to be helpful in this process. Indeed, the association between quality of communication and patient outcomes is repeatedly demonstrated by retrospective analyses of incidents and adverse-event reports.<sup>30</sup> Though, the attention of clinicians is claimed by medical choices in diagnostics and therapeutic strategies other aspects such as determination of short and long term goals in care, and coordination of activities should also be well-run. Attention to the communication process is easily confused with friendliness instead of ensuring that the choices that are made are applied appropriately and uniformly. Therefore, in our point of view it is relevant to evaluate the quality of IDRs regularly with a quantitative instrument. All 3 ICUs that were rated in this study had considered their IDRs to be adequately performed, and they were surprised by our study results (Table 2).

For example, Table 2 revealed higher scores in ICU 1 and ICU 2 than ICU 3 on secondary problems, short-term interventions and encouraging input of nurses. At the same time, the main problem, developing explicit patient goals and long-term interventions, was less discussed. The finding that all 3 ICUs rated low on the indicator "It is clear who is responsible for performing tasks" (Table 2) was not surprising to some leading intensivists. They had experienced that appointments made during IDRs frequently needed confirmation or extra explanation to junior physicians and ICU nurses because of different interpretations, and they planned ward rounds immediately after the IDRs. This is an ineffective, inefficient way of discussing daily patient care. Therefore, we feel that our developed instrument may be helpful in improving quality and efficiency of IDR.

The use of the instrument in the ICU includes 2 levels, including the rating of the 10 essential quality indicators or all 19 indicators that assess both the essential and the

supportive indicators. The rating of the essential indicators is appropriate for real-time assessment. To rate all indicators, we feel that it is necessary to use videotaped IDRs. These tapes are helpful in the process of evaluation and feedback.

The IDR Assessment Scale has the benefit of being simple, it is derived from daily practice and it is easily applicable. However, as with other outcomes scales, there is a trade-off between providing a full description and making the scale simple enough for practical use. Future studies may 1) enable expansion of the scale for predictive value for outcomes such as staff satisfaction, patient and family satisfaction, and clinical outcome, 2) test the IDR Assessment Scale in other ICUs to establish general applicability, 3) enable expansion of the scale for measuring improvement of the performed IDR after interventions.

In conclusion, this study showed that the quality of IDRs can be reliably assessed for patient plan of care and process. The IDR Assessment Scale had satisfactory interrater reliability, excellent overall item score correlations, and acceptable internal consistency. Our instrument may provide feedback for ICU care professionals and managers to develop adjustments in quality of care. Testing the IDR Assessment Scale in other ICUs may be required to establish general applicability.

## **ACKNOWLEDGEMENTS**

The authors thank all ICU care professionals who consented to being videotaped for this study. We thank DJ Kleijer for his valuable participation in the Delphi rounds. We thank HEP Bosveld for performing the statistical analysis and RL Brand and Mrs. HT Kolkert-Kraanen for rating videotapes.

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## CHAPTER 3

# USABILITY AND RELIABILITY OF A CHECKLIST TO FACILITATE LEADING INTERDISCIPLINARY ROUNDS IN THE INTENSIVE CARE UNIT

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**ABSTRACT**

**Content:** Leadership skills are important for interdisciplinary teams to provide coordinated and safe patient care. Current leadership skill development for fellows in intensive care training programs is based on role modeling. We developed a checklist aimed to facilitate leading interdisciplinary rounds (IDRs) in the intensive care unit (ICU).

**Methods:** A checklist that included the 10 essential quality indicators of the Interdisciplinary Rounds Assessment Scale was tested for interrater reliability, internal consistency, and factor analysis. The need and usability of the checklist was tested by application in real-life IDRs. We videotaped IDRs led by experienced intensivists that included 99 discussions about the care plan for patients. We computed and analyzed descriptive statistics for differences in ratings for checklist and intensivists.

**Results:** The interrater reliability among 3 raters was satisfactory ( $\kappa$ , 0.85). The internal consistency was acceptable ( $\alpha$ , 0.74). Factor analysis showed all factor loadings on 1 domain > 0.65. Application tests showed a wide range of “no” to “yes” scores among experienced physicians. The checklist appeared useful to facilitate fellow- intensivists in training to lead interdisciplinary rounds.

**Conclusions:** The checklist with 10 quality indicators may be a reliable and useful checklist for fellow-intensivists to facilitate leading interdisciplinary teams during interdisciplinary rounds.

**KEY WORDS:** medical education, communication, leadership, patient-centered care, quality indicators

**ARTICLE SUMMARY****STRENGTHS AND LIMITATIONS OF THIS STUDY**

- Leadership skills are important to direct interdisciplinary patient-centered care and quality improvement in the intensive care unit, but there is a lack of checklists to guide leadership skills.
- Leadership skills frequently are learned by role modeling senior physicians, but most experienced physicians serve as role models without specific intention or awareness.
- The strength of the checklist to guide interdisciplinary rounds is that it integrates leadership, technical performance, communication, and coordination skills in leading well performed interdisciplinary rounds. Most previous studies considered these domains separately.
- The study was performed in 1 centre and may have limited generalizability.
- Future research may evaluate the extent to which scores improve when fellow intensivists are given the instrument to guide their meeting, and may evaluate the checklist as a self-assessment tool at the end of the IDR.

**FUNDING:** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**COMPETING INTERESTS STATEMENT:** None declared.

## INTRODUCTION

The implementation of interdisciplinary teams in the intensive care unit (ICU) to provide patient-centered care, in contrast with traditional discipline-centered care, has focused attention on the relevance of leadership behaviour.<sup>1-3</sup> Leadership skills are crucially important for determining the extent to which interdisciplinary teams provide coordinated and safe patient care.<sup>4-6</sup> Safe patient care is associated with a decrease in adverse events.<sup>6</sup> Despite the importance of good leadership, training leadership skills is a small and nonspecific component of the curricula of most medical schools.<sup>1,2,7-12</sup>

Leadership skills are defined as “the process of influencing others to understand and agree about what needs to be done and how to do it, and facilitating individual and collective efforts to accomplish shared objectives”.<sup>13</sup> Leadership skills are observable and learnable, but most physicians may acquire leadership skills by role-modeling senior physicians and colleagues.<sup>14-16</sup> Although role-modeling is an integral component of obtaining competencies, many physicians may assimilate leadership techniques that are inadequate.<sup>17,18</sup> Furthermore, most senior physicians serve as a role model informally and episodically, without specific intention or awareness.<sup>19</sup>

A daily recurring situation in the ICUs, which integrates leadership skills and patient centred care, are interdisciplinary rounds (IDRs). Leading IDRs is a standard required by the training program of ICU fellows.<sup>20</sup> IDRs are patient-centered communication sessions that are performed to integrate care delivered by specialists from different disciplines.<sup>21,22</sup> Although well performed IDRs are recommended, the performance may be complicated by factors such as limited time, multiple targets, technical therapies, and varied responsibilities of different care providers.<sup>21,23</sup>

Previous studies have investigated checklists to guide team performance and communication during IDRs, but little information is available about the integration of leadership skills with the technical performance (“patient plan of care”) and communication and coordination aspects (“process”) of IDRs.<sup>24-28</sup> Multiple instruments have been developed to assess role-models, however these instruments do not discriminate between positive and negative role modeling or identify the specific aspects of the role models performance that represent the correct professional behaviour to imitate.<sup>18</sup>

On this background, we performed a study in which the 10 essential quality indicators of the IDR Assessment Scale were tested as a checklist to facilitate leading IDRs. The IDR Assessment Scale was aimed to assess the quality of IDRs in the ICUs

and included 10 essential and 9 supportive quality indicators.<sup>29,30</sup> Confirmation of a well performed IDR in the ICU was reached when the 10 essential quality indicators were rated as “yes” or “not applicable”.<sup>29</sup>

The principal aim of this study was to critically assess the reliability and usability of the checklist to facilitate leading IDRs in the ICUs for fellow intensivists. We also described the outcomes of senior intensivists (role models) while discussing 99 patient discussions during IDRs in the ICUs.

## METHODS

### Study setting

This study was performed in a university medical centre for intensive care in Groningen, the Netherlands. The intensive care department included 4 ICUs for adults (thoracic, medical, surgical, and neurologic; total, approximately 3000 patients admitted per year). The study period ranged from July 2009 to May 2011. For the present study, we analyzed data about 10 IDRs led by 10 senior intensivists.

In all 4 ICUs, daily IDRs were organized separate from morning rounds and change-of-shift reports as endorsed by the Society of Critical Care Medicine.<sup>31</sup> At the IDRs, specialists shared information, addressed patient problems, and planned and evaluated treatment.<sup>29,32</sup> In a typical IDR starting at 11:00 AM, the care plans of approximately 12 patients were discussed during 2 hours. Physicians (senior intensivists) led the sessions; junior physicians gave clinical patient presentations, and bedside nurses and consultants gave additional relevant and current information. The presence of specialist consultants varied with each patient and included surgeons, respiratory specialists, nephrologists, or neurologists.

### Checklist

The checklist of leadership behaviour of the leading physicians during IDRs was created on the basis of previously described principles including (1) a focus on the needs of caregivers, (2) brevity, (3) ease of use, and (4) rigorous preliminary testing and validation (Table 1 and 2).<sup>33</sup> The 10 essential quality indicators of the checklist were compared with the results of a literature search about leadership in the ICU.<sup>1,2,6,9,16,34,35</sup> In addition, the indicators were checked by asking critical care physicians, nurses, and trainers for suggestions to reduce ambiguity.<sup>33</sup> As a result, no additional indicators were considered useful to lead IDRs (Table 1).<sup>22</sup>

*Table 1. Definitions of the Essential Quality Indicators of the Interdisciplinary Rounds Assessment Scale\**

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PATIENT PLAN OF CARE

1. Main problem discussed (0.917).<sup>†</sup>  
*By verbal identification of the (provisional) main problem according to patient response to treatment, or same as indication(s) for admission to the ICU.*
2. Diagnostic plan discussed (0.897). To discuss those activities (laboratory tests, computed tomography scans, radiographs, or consults with other consultants) for the purpose of determining diagnosis or excluding specific problems or complications.
3. Provisional goal formulated (0.897).  
*What must be done to get this patient to the next level of care or discharged from the ICU?*
4. Long-term therapeutic items (> 16 h) discussed (0.797).
5. Patient greatest risk discussed (0.668).  
*The risk of a widespread or serious complication that can occur because of factors associated with the patient, therapy, or stay in the ICU, or same as indication(s) for admission of patient to the ICU.*

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PROCESS

6. Expectations made clear by consultants (0.762).  
*Consultant gives explanation, advice, or justification of specific therapeutic issues related to the patient.*
7. Input of junior physicians encouraged (0.710).  
*Junior physicians have an opportunity to speak.*
8. Input of nurses encouraged (0.732).  
*Nurses have an opportunity to speak.*
9. Summary given (0.867).  
Overview of patient's treatment plan is given: diagnoses, goals, therapy, priority, and identification of responsible providers. When appropriate, the summary includes diagnostic plan.
10. It is clear who is responsible for performing tasks (0.710).  
*Core duties for team members are discussed. Tasks are cross-checked to ensure a shared understanding.*

\*Number of quality indicators, 10. Descriptions of each quality indicator were outlined in a manual for users of the Interdisciplinary Rounds Assessment Scale. Abbreviations: ICU, intensive care unit.

<sup>†</sup>Numbers in parentheses were the results of factor analysis that found all factor loadings of 10 essential quality indicators on 1 domain.

### Usability of the checklist

The usability of the checklist was examined by (1) trained raters who rated the indicators during the IDRs while the rounds were videotaped at the same time; (2) individual feedback session with the leading intensivists after their rounds were videotaped; and (3) during ward- and staff meetings with all participants of the IDRs.<sup>22,33</sup>

All participants of the IDRs were informed by ward and staff meetings about the videotaping of IDRs. Before the IDR started, the video camera was placed in the corner of the meeting room to enable the rating of all participants. At the end of the IDR, the video camera was removed.

The Medical Ethical Testing Committee of the University of Groningen waived Institutional Research Board approval for videotaping IDRs in the ICUs because of the observational design of the study and because staff members (not patients) were the study subjects.

### Quantitative observation of role-modeling behaviour of the senior intensivists

In total, 10 senior intensivists (9 men and 1 woman) from 4 ICUs participated voluntarily in the study. The schedule of videotaping IDRs was arranged on days when participating intensivists were present. The intensivists were from 3 to 20 years after graduation from training as intensivists and had previous graduate medical experience in internal and pulmonary medicine and anaesthesiology. They were qualified to train trainees by role modeling to lead IDRs.

To test role-modeling behaviour of 10 senior intensivists in a quantitative way, we used the  $\chi^2$  test (chi-square test).<sup>36</sup> This test uses descriptive statistics of data and compares the range of frequencies of each essential quality indicator by each physician. The hypothesized standard is: “all 10 essential quality indicators are rated with yes in 90% of each patient discussed during the IDR”. Significant outcomes imply deviance from the hypothesized standard, while non-significant outcomes imply (more) obtainment of this hypothesized standard.

### Training of raters for assessment

There were 3 raters, including 1 intensivist, 1 ICU nurse, and 1 author (E.T.H.), who were trained by assessing 9 videotaped patient presentations led by different intensivists. Responses were checked by the manual to confirm that definitions were



applied uniformly and by testing interrater reliability (definitions extracted from the manual are shown in Table 1). When the interrater reliability was  $\geq 0.70$ , the training was considered effective and the 3 raters were allowed to rate 90 other patient presentations. The quality of the individually tested patient presentations was checked by random testing of patient presentations by another rater to determine whether interrater reliability was  $\geq 0.70$ .<sup>37</sup>

All indicators were described in terms of observable behaviour that was explained in a manual necessary for using this assessment instrument. The raters qualified their observations with the definition of the quality indicator using a 3-point scale to indicating whether the behaviour occurred during each individual patient presentation: (1) No (the behaviour was not observed; 1 point); (2) Doubt/inconsistent (verbalizations or behaviours were inconsistent with the quality indicator; 2 points); or (3) Yes (the behaviour was clearly observed and consistent with the quality indicator; 3 points).

Some items had a “not applicable” option when the indicator could not be rated. The “not applicable” option was incorporated because indicators as diagnostic plan discussed, long term interventions discussed, and patient greatest risk discussed, may not be applicable in case of end-of-life palliative care consultation or discharge from the ICU. The “not applicable” option was incorporated by indicators which were related to junior physicians, ICU nurses, and/or specialist consultants, to facilitate application of the checklist to various ICUs.

#### Statistical analysis

Data were analysed with statistical software (SPSS for Windows, Version 15.0, SPSS Inc., Chicago, IL, USA). Power analysis was performed to determine the sample size needed to obtain enough observations for a reliable analysis. Validity was tested with interrater reliability, internal consistency, and factor analysis.<sup>30</sup> Interrater reliability was tested with 3 raters who examined the indicators in 9 randomly selected patient presentations.<sup>37-39</sup> Internal consistency of the checklist with the 10 essential quality indicators was measured with Cronbach  $\alpha$ . Exploratory factor analysis was performed with rotation method (Varimax with Kaiser normalization).<sup>29</sup>

## RESULTS

Evaluation of usability of the checklist showed that rating of the essential indicators was appropriate and sufficiently brief for clinical assessment. During the evaluation of results of the assessed IDRs, individual and ward discussions of the checklist showed that there was no ambiguity about the indicators.

Power analysis showed that a sample size of 98 patient presentations during IDRs was necessary for validity tests of the checklist. The interrater reliability of the checklist among 3 raters was satisfactory ( $\kappa$ , 0.85). To decrease potential bias from shared understanding of the developed methods, another 20 patient presentations were corroborated by an additional independent nonmedical rater, with adequate agreement shown ( $\kappa$ , 0.82). Internal consistency was acceptable ( $\alpha$ , 0.74). Factor analysis showed all factor loadings of 10 essential quality indicators on 1 domain > 0.65 (Table 1).

During 99 patient presentations during IDRs, the frequency of “yes” ratings of the checklist showed different outcomes about leading the IDRs (Table 2).

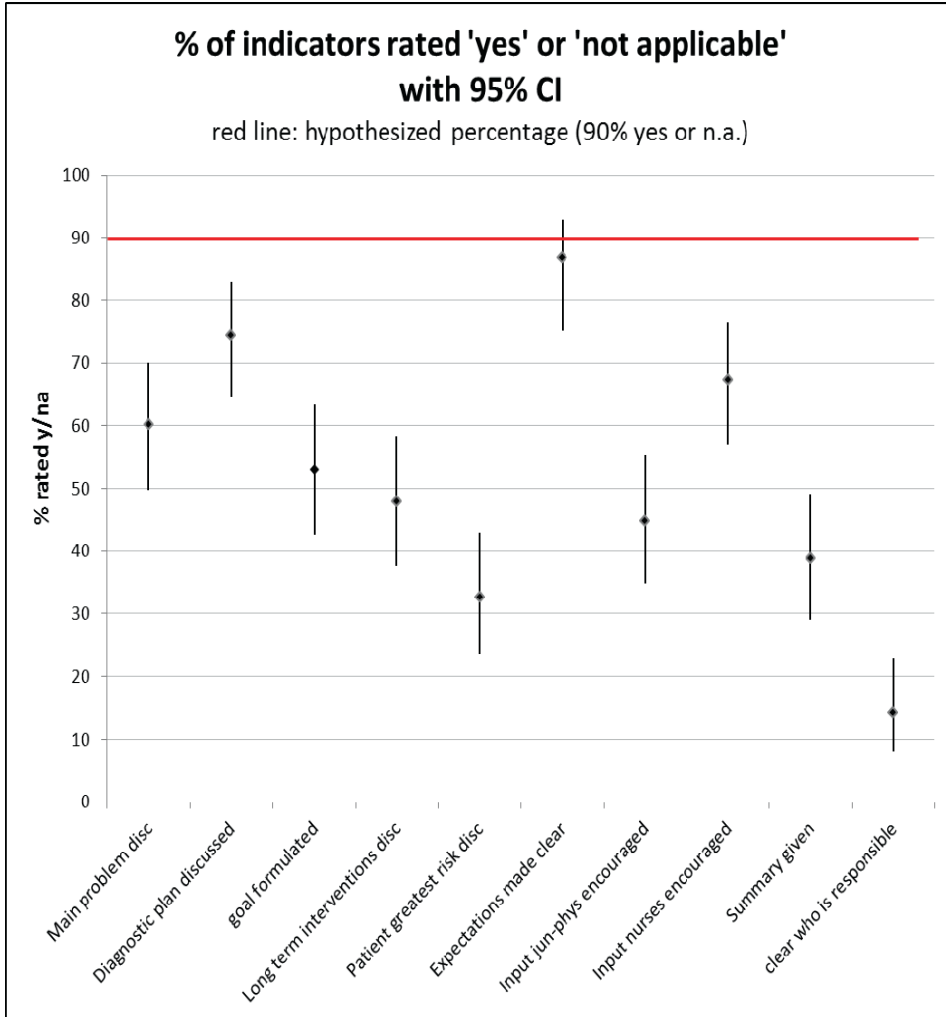
Quantitative observation of role modeling behaviour showed that the performance of leading IDRs varied per intensivist and per quality indicator. The differences between the hypothesized standard and saturated results showed that 9 of 10 essential quality indicators were markedly rated lower than the hypothesized standard of 90% “yes” scores. Only 1 essential quality indicator (Expectations made clear by consultants) was similar to the hypothesized standard of the 90% yes scores (Figure 1).

*Table 2. Application of the Essential Indicators of the Interdisciplinary Rounds Assessment Scale in Clinical Scenarios in the Intensive Care Unit\**

	<b>ESSENTIAL QUALITY INDICATOR</b>	<b>No (%)</b>	<b>Doubt (%)</b>	<b>Yes (%)</b>	<b>Not applicable (%)</b>
	<b>DOMAIN "PATIENT PLAN OF CARE"</b>				
1	Main problem discussed	21 (21)	19 (19)	59 (60)	-
2	Diagnostic plan discussed	23 (23)	3 (3)	66 (67)	7 (7)
3	Provisional goal formulated	24 (24)	23 (23)	52 (53)	-
4	Long term interventions (> 16 h) discussed	43 (43)	9 (9)	46 (47)	1 (1)
5	Patient greatest risk discussed	59 (60)	8 (8)	32 (32)	0 (0)
	<b>DOMAIN "PROCESS"</b>				
6	Expectations made clear by consultants	14 (14)	0 (0)	85 (85)	0 (0)
7	Input of junior physicians encouraged	27 (27)	28 (28)	41 (41)	3 (3)
8	Input of nurses encouraged	17 (17)	16 (16)	66 (67)	0 (0)
9	Summary given	49 (50)	12 (12)	38 (38)	-
10	It is clear who is responsible for performing tasks	77 (78)	8 (8)	14 (14)	-

\*N = 99 patient presentations in 9 interdisciplinary rounds lead by 10 senior physicians. Essential indicators of the Interdisciplinary Rounds Assessment Scale: each item was answered with either 1 (no), 2 (doubt), 3 (yes), or not applicable (except there was no "not applicable" option for items 1, 3, 9, and 10. Data were reported as number (%) of the no, doubt, yes, or not applicable rating.

*Figure 1. Results of the differences between the hypothesized and saturated model (With 95% Confidence Interval. With 99 patient presentations during ten interdisciplinary rounds by ten leading senior physicians.*



## DISCUSSION

In the present study, we tested the usability and reliability of a checklist (including 10 essential quality indicators of the IDR Assessment Scale) to facilitate leading IDRs in ICUs. The checklist confirmed usability, reliability, and internal inconsistency. The results also showed that learning these skills by role-modeling may be confusing for fellow intensivists because of the diversity in leading behaviour of the senior intensivists.

Strengths of this study include the use of a quantitative instrument to lead IDRs because this instrument identified issues that were not obvious to experienced intensivist. In daily practice, the attention of clinicians may be dominated by choices that require immediate attention, such as ventilator settings, vasopressors, and imaging studies. Long-term interventions and coordination may be given little attention but may be important. In addition, attention to the communication process may be confused with friendliness instead of ensuring that appropriate technical choices are applied uniformly.

Limitations of this study include the performance of the study at a single centre, which may limit generalizability. In addition, the senior intensivists were not inquisitive about the checklist because they considered their IDRs to be adequately performed and they were surprised by the results of the study; they assumed that they had discussed all relevant indicators. Familiarity with the checklist may have generated other outcomes.

In the present study, the male: female ratio (9:1) may have skewed the results. Training leadership skills may be affected by sex and personality.<sup>14,40</sup> During resuscitation tests, female students may show less leadership behaviour and have less hands-on time than males students. However, males care providers may have less leadership skills when tasks require complex social interactions, which may require more relationship-oriented (“female”) leadership, in accordance with sex stereotypes.<sup>14,40</sup>

Furthermore, there was no assessment of the scores for predictive value for any type of patient outcome, such as length of stay.

The present study is unique because it quantitatively measures the effect of role modeling for training leadership skills for fellow-intensivists. The study has clinical relevance because the quality indicators enable the objective, incremental analysis of the process of learning to lead IDRs. Furthermore, the study provides insight about the

effectiveness of the current way to develop leadership skills because it may identify specific aspects of the role models performance that represent the correct professional behaviour to imitate. When analyzing these outcomes, training program directors can decide whether the current strategy of role modeling is the most appropriate way to learn these leadership skills. The checklist may provide feedback for the leading physicians and the ICU management to guide individual leading skills, team leading skills, and junior physicians, and this may improve the potential for developing appropriate treatment plans for the ICU patient. Although beyond the scope of this study, we assume that training may be less time consuming to learn to lead IDRs than the current role modeling method.

Further study may evaluate whether the use of criteria-based guidelines, such as this checklist, may help fellow-intensivists recognize which aspects of the clinical trainer's professional behaviour to imitate, by adding the important step of apperception to the process of learning leadership competencies through observation. It may be necessary to repeat the present study in other health care settings to further develop the checklist and establish generalizability.

Future study may evaluate the effect of using this checklist on the predictive value for outcomes such as staff satisfaction, patient and family satisfaction, or clinical outcomes. In addition, future research may evaluate the extent to which scores improve when fellow intensivists are given the instrument to guide their meeting, and may evaluate the checklist as a self-assessment tool at the end of the IDR.

## CONCLUSION

The IDR checklist may be useful and reliable in facilitating fellow intensivists to lead IDRs and provide appropriate plans for the ICU patient. Quantitative observation with this checklist that included 10 essential quality indicators of the IDR Assessment Scale showed that the performance of leading IDRs may vary among physicians. Therefore, learning by role-modeling to obtain leadership skills may be confusing and ineffective.

## ACKNOWLEDGEMENTS

The authors thank all ICU care professionals who consented to being videotaped for this study. We thank the Management Team of the Critical Care Department for general support. We thank H.E.P. Bosveld for performing the statistical analyses.

### **AUTHOR CONTRIBUTIONS**

All authors contributed to the conception and design of the study, acquisition of data, and analysis and interpretation of the data. E.T.H. drafted the manuscript, which was reviewed and revised by the other authors.

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## CHAPTER 4

# QUALITY IMPROVEMENT OF INTERDISCIPLINARY ROUNDS BASED ON ESSENTIAL QUALITY INDICATORS OF THE INTERDISCIPLINARY ROUNDS ASSESSMENT SCALE

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*Intensive Care Medicine, 2013;39:1800-1807.*

**ABSTRACT**

**Purpose:** The implementation of interdisciplinary teams in the intensive care unit (ICU) has focused attention on leadership behavior. Daily interdisciplinary rounds (IDRs) in ICUs integrate leadership behavior and interdisciplinary teamwork. The purpose of this intervention study was to measure the effect of leadership training on the quality of IDRs in the ICU.

**Methods:** A nonrandomized intervention study was conducted in four ICUs for adults. The intervention was a 1-day training session in a simulation environment and workplace-based feedback sessions. Measurement included 28 videotaped IDRs (total, 297 patient presentations) that were assessed with 10 essential quality indicators of the validated IDR Assessment Scale. Participants were 19 intensivists who previously had no formal training in leading IDRs. They were subdivided by cluster sampling into a control group (ten experienced intensivists) and intervention group (nine intensive care fellows). Mann-Whitney –*U* test was used to compare results between control and intervention groups.

**Results:** Baseline measurements of control and intervention groups revealed 2 indicators that differed significantly. The frequency of yes ratings for the intervention group significantly increased for 7 of the 10 indicators from before to after intervention. The frequency of yes ratings after training was significantly greater in the intervention than control groups for 8 of the 10 essential quality indicators.

**Conclusions:** The leadership training improved the quality of the IDRs performed in the ICUs. This may improve quality and safety of patient care.

**KEY WORDS:** Medical education, Communication, Critical care, Patient-centered care

## INTRODUCTION

The implementation of interdisciplinary teams in the intensive care unit (ICU) to provide patient-centered care, in contrast with traditional discipline-centered care, has focused attention on the relevance of leadership behavior.<sup>1-2</sup> Although leadership is conceptualized in various ways, studies emphasize the importance of leadership in the hospital and ICU for effective, coordinated, and safe patient care and safety improvement efforts.<sup>3-7</sup> Safe patient care is associated with a decrease in adverse events, especially when clinician leaders encourage all team members to contribute to the decision-making process for patient care.<sup>4</sup> Leadership behavior is defined as “the process of influencing others to understand and agree about what needs to be done and how to do it, and facilitating individual and collective efforts to accomplish shared objectives”.<sup>8</sup>

Recent studies in a simulated environment showed that leadership behavior can be trained, and this improves subsequent team performance during resuscitation.<sup>9</sup> Therefore, leadership behavior is an observable, learnable set of practices — a competency, more than a trait.<sup>10</sup> However, without training, leadership behavior may be influenced by sex and personality.<sup>11,12</sup>

We conducted a study that focused on behavior of intensivists while leading interdisciplinary rounds (IDRs) in the ICU. An IDR is a patient-centered communication session to integrate care delivered by specialists from different disciplines.<sup>13-15</sup> Well-performed IDRs are recommended in the ICU because ineffective interdisciplinary communication among medical teams may cause preventable patient harm and severe conflicts within ICUs.<sup>15-17</sup> However, performing IDRs may be complicated by factors such as limited time, multiple targets, patient instability, highly technical therapies, and varied responsibilities of different providers. Therefore, leadership behavior of intensivists is important for the success of IDRs.<sup>2,6,18-19</sup>

We used the 10 essential quality indicators of the validated IDR Assessment Scale to provide a coherent program to structure the content and assessment of leadership training.<sup>13,20</sup> This scale had been developed to assess the quality of IDRs in the ICUs. The principal aim of this study was to critically assess the effect of leadership training on the quality of IDRs in the ICU.



## **MATERIALS AND METHOD**

### Study design

This nonrandomized intervention study was performed in four ICUs for adults at the University Medical Center in Groningen, the Netherlands. These ICUs (thoracic, medical, surgical, and neurologic) together admitted approximately 3000 patients per year. There were 23 experienced intensivists, 10 ICU fellows, a varied number of junior physicians, and 288 ICU nurses employed. During typical practice, daily IDRs were organized separate from morning rounds or reports at changes of shifts as endorsed by the Society of Critical Care Medicine.<sup>15</sup> In a typical IDR, which was a discussion away from the bedside, the care plans of 12 patients were discussed (total, 120 minutes). The IDRs were directed by intensivists; junior physicians gave clinical patient presentations, and bedside nurses and consultants gave additional relevant and current information. The presence of specialist consultants varied with each patient and included surgeons, nephrologists, neurologists, and specialists in infectious diseases. The plan of care was determined by the leading intensivist and was agreed, understood, and executed by all involved providers in the ICU.

Data were collected from July 2009 to May 2011. During this period, 28 IDRs were videotaped and the planning was tailored to the shifts of the leading intensivists. Before the IDR started, the video camera was placed in the corner of the meeting room to enable rating of all participants. At the end of the IDR, the video camera was removed.

The Medical Ethical Testing Committee of the University of Groningen waived Institutional Research Board approval for videotaping IDRs in the ICUs because of the observational character of our study and because staff members were the study subjects (not patients).

### Participants

The intensivists who participated were previously untrained in leading IDRs and they were selected by cluster sampling into control and intervention groups (Figure 1). The control group included ten experienced intensivists (nine men and one woman) from the ICUs with 3 to 20 years of clinical experience after graduation from training as intensivists. They participated voluntarily in being videotaped while each led one IDR and their performance was individually discussed in reference to the IDR Assessment

Scale. None of the intensivists in the control group participated in the leadership training course.

The intervention group included nine ICU fellow trainees (three men and six women), and one other fellow was not included because of reallocation to another hospital. These fellows had 4 to 6 years of previous graduate medical experience in internal and pulmonary medicine, anaesthesiology, or surgery. All fellows were experienced in leading IDRs (average, 30 IDRs each). They participated in the study because this was required for their educational program and informed consent was assumed.<sup>20</sup> The fellows were videotaped while leading one IDR and their performance was individually discussed in reference to the IDR Assessment Scale.

Anonymity of the participants was assured. No demographic information was collected.

#### Assessment of leadership

To support and assess leading IDRs, the ten essential quality indicators derived from the IDR Assessment Scale were used.<sup>13</sup> Development was based on literature review and Delphi Rounds, and the scale was statistically tested and applied to 98 patient discussions performed in three ICUs in two hospitals. The ten extracted essential indicators were used as a checklist.

To confirm that these indicators corresponded to an appropriate assessment of leadership behavior of the leading intensivists during IDRs, we compared the indicators with a literature search about leadership in the ICU. In addition, the indicators were checked by asking critical care physicians, nurses, and trainers where it was necessary to reduce ambiguity. In both situations, no additional indicators were considered useful to guide and assess leading IDRs.

The checklist included two domains: (1) patient plan of care and (2) process. The patient plan of care domain included five essential quality indicators and reflected the technical performance from the initial identification of a patient-related goal to the evaluative phase. The process domain, which also included five essential quality indicators, reflected the ICU processes that were important to ensure that the appropriate plan of care was agreed to, understood, and performed as planned by all involved caregivers (Table 1).

All quality indicators were described in terms of observable behavior that was explained in a manual necessary for using this assessment instrument (Table 1). Trained raters qualified their observations with the definition of the quality indicator using a 3-point scale, indicating whether the behavior occurred during each individual patient presentation: (1) “no” (the behavior was not observed); (2) “doubt/inconsistent” (verbalizations or behaviors were inconsistent with the quality indicator); or (3) “yes” (the behavior was clearly observed and consistent with the quality indicator). Some items had an option “not applicable” when the indicator could not be rated. In an optimal IDR, the 10 essential quality indicators were rated with “yes” or “not applicable”.<sup>13</sup>

*Table 1. Definitions of the Essential Quality Indicators of the Interdisciplinary Rounds Assessment Scale \**

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PATIENT PLAN OF CARE	
1. Main problem discussed (0.917). <sup>†</sup>	<i>By verbal identification of the (provisional) main problem according to patient response to treatment, or same as indication(s) for admission to the ICU.</i>
2. Diagnostic plan discussed (0.897). To discuss those activities (laboratory tests, computed tomography scans, radiographs, or consults with other consultants) for the purpose of determining diagnosis or excluding specific problems or complications.	
3. Provisional goal formulated (0.897).	<i>What must be done to get this patient to the next level of care or discharged from the ICU?</i>
4. Long-term therapeutic items (> 16 h) discussed (0.797).	
5. Patient greatest risk discussed (0.668).	<i>The risk of a widespread or serious complication that can occur because of factors associated with the patient, therapy, or stay in the ICU, or same as indication(s) for admission of patient to the ICU.</i>

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PROCESS

6. Expectations made clear by consultants (0.762).

*Consultant gives explanation, advice, or justification of specific therapeutic issues related to the patient.*

7. Input of junior physicians encouraged (0.710).

*Junior physicians have an opportunity to speak.*

8. Input of nurses encouraged (0.732).

*Nurses have an opportunity to speak.*

9. Summary given (0.867).

Overview of patient's treatment plan is given: diagnoses, goals, therapy, priority, and identification of responsible providers. When appropriate, the summary includes diagnostic plan.

10. It is clear who is responsible for performing tasks (0.710).

*Core duties for team members are discussed. Tasks are cross-checked to ensure a shared understanding.*

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\* Number of quality indicators, 10. Descriptions of each quality indicator were outlined in a manual for users of the Interdisciplinary Rounds Assessment Scale. The essential indicators were derived by a confirmative factor analysis, with factor loadings on the first domain > 0.65 and are noted in parentheses

#### Training of raters to assess patient discussions

The first three raters included one intensivist, one ICU nurse, and one author (E.T.H.). They were trained by assessing nine videotaped patient discussions led by different intensivists of the control group. Responses were evaluated by the manual to confirm that definitions were applied uniformly and by testing the interrater reliability. When the interrater reliability was at least 0.70, their training was considered effective and they were allowed to rate 90 other patient discussions. Owing to the large number of patient discussions of the before and after tests, another three raters were trained and tested with the same procedure. The quality of the individually tested patient discussions was checked by random testing of patient discussions by another rater and testing if interrater reliability was at least 0.70.

Raters were not informed about the details of the intervention.

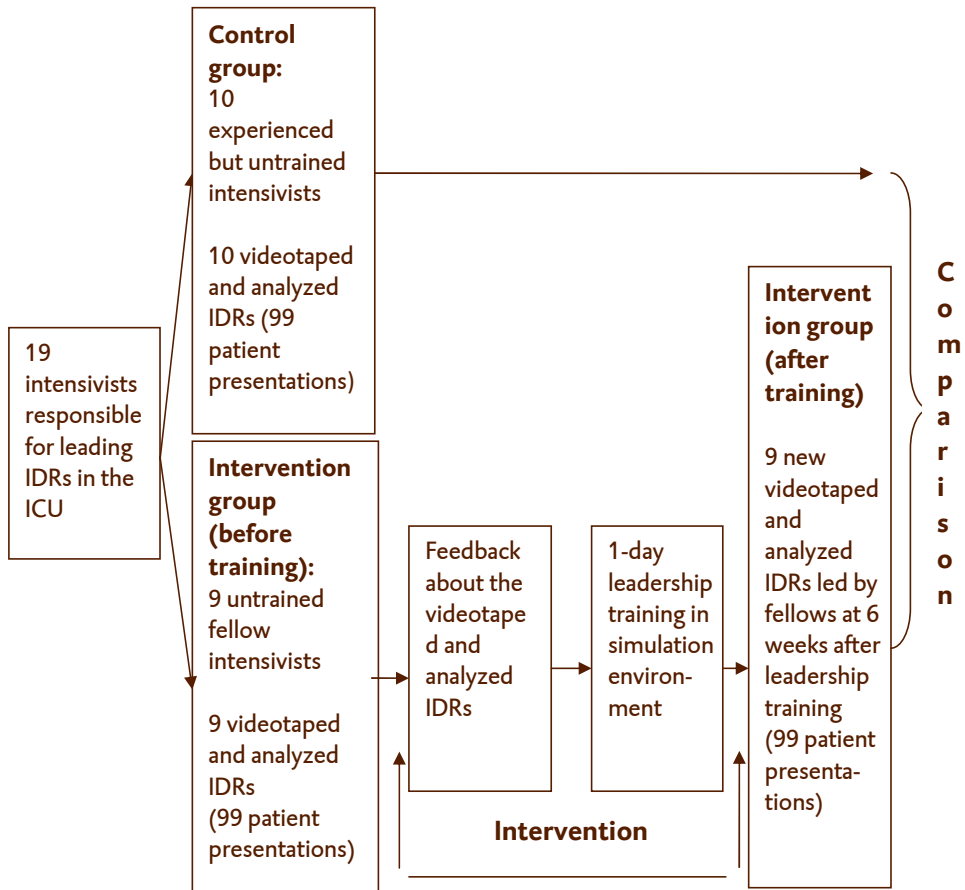
### Intervention

The intervention (IDR leadership training program) included three sessions: (1) preparation; (2) a 1-day training; and (3) feedback. The preparation session focused on leading IDRs in typical practice and included a videotaped and analyzed IDR led by each participant (Figure 1).

The 1-day training session was performed in a simulated and videotaped environment. Videotaping team performance in well-controlled study settings allowed rigorous assessment of complex interactions during realistic IDR situations without putting patients at risk.<sup>9</sup> The training was consistent with principles of adult learning and behavioral modeling, and it incorporated the following elements: multiple learning activities; small group skill practice and problem- solving sessions; performance feedback and reinforcement of newly learned skills; and a planning assignment for on-the job applications.<sup>20-22</sup> These elements were processed into four real-life, progressively complex IDR scenarios about patient plan of care and conflicting situations (Electronic Supplementary Material). The fellows participated in these scenarios as leading intensivists, and the roles of other IDR team members (ICU nurses, junior physicians, and specialist consultants) were performed by ICU care professionals who had experience in performing roles in simulation courses. Each scenario was evaluated with the participants in reference to the ten essential quality indicators by two trainers in communication skills who were familiar with daily ICU practice.

The feedback session of the intervention group was performed as part of the regular practice in the ICU at approximately 6 weeks after the 1-day training session and was based on a new videotaped and analyzed IDR that had been led by each trained participant. This also was individually discussed in reference to the IDR Assessment Scale.

Figure 1.  
Overview of the study design



### Data analysis

Confirmative factor analysis of the 10 essential quality indicators was performed with 98 patient discussions.<sup>27</sup>

Internal consistency of the checklist with the 10 essential quality indicators was measured for 198 videotaped patient presentations with Cronbach  $\alpha$ .

Interrater reliability was tested by three raters who examined the indicators in nine randomly selected patient discussions of the control group. A multirater Cohen kappa calculator was used to assess outcomes per quality indicator for the three raters of each patient discussion.<sup>24</sup> Adequate interrater reliability was defined by  $\geq 0.70$ .<sup>25,26</sup>

The intraclass correlation of the first nine patient discussions was examined by measuring the average score correlation between pairs of raters (one intensivist [rater 1]; one author [E.T.H., rater 2]; and one ICU nurse [rater.3]). Pearson correlation coefficients ( $r$ ) were determined.

The Mann-Whitney  $U$  test for paired comparisons of each essential quality indicator was used to compare the results of the control and intervention groups about the quality of leading IDRs. In all cases, the Bonferroni adjustment was used and statistical significance was defined by  $P \leq 0.03$ . (Electronic Supplementary Material).

## **RESULTS**

Confirmative factor analysis with 98 patient discussions revealed 10 essential quality indicators with factor loadings on the first domain of the IDR Assessment Scale of greater than 0.65 (Table 1).

Internal consistency was acceptable ( $\alpha = 0.72$ ).

The interrater reliability of nine patient presentations by three raters was satisfactory ( $k = 0.85$ ), and the remaining patient discussions of the control group were further tested by these raters separately. To diminish bias from shared understanding from the developed methods, another 20 patient presentations were corroborated by an additional independent nonmedical rater which also showed adequate agreement ( $k = 0.82$ ). This procedure was repeated with three additional raters ( $k = 0.75$ ).

Intraclass correlation coefficient (0.72) showed fair reproducibility between the observers. The overall item score correlations between the first three raters were excellent. There was a significant correlation between rater 1 and rater 2 ( $r = 0.83$ ;

$P < 0.0001$ ); rater 1 and rater 3 ( $r = 0.8$ ;  $P < 0.000$ ); and between rater 2 and 3 ( $r = 0.94$ ;  $P < 0.0001$ ) (Fig. 2).

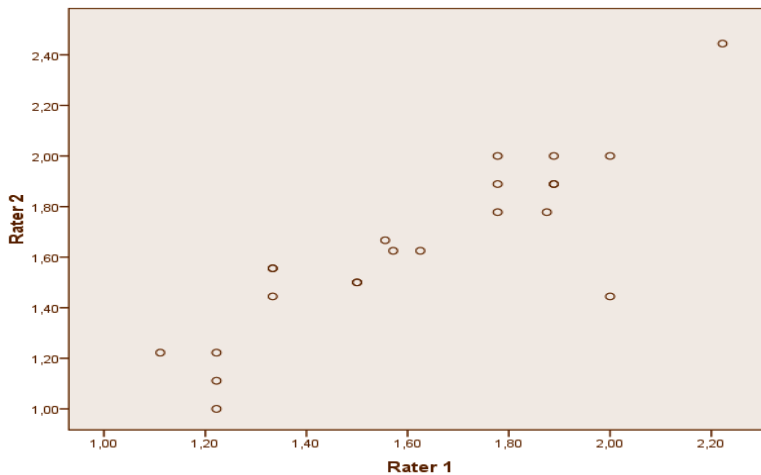
The Mann–Whitney  $U$  test was applied to 28 IDRs and included 297 videotaped patient presentations subdivided in three groups: (1) control group (99 presentations); (2) intervention group (99 presentations, test before training); and (3) intervention group (99 presentations, test after training) (Fig. 1).

Comparison of results for the control group and the intervention group before training showed that the frequency of “yes” ratings was significantly greater in two of the ten essential indicators for the control group (Table 2).

Comparison of the intervention group before and after training showed that the frequency of “yes” ratings was significantly increased after training for seven of the ten essential quality indicators (Table 2).

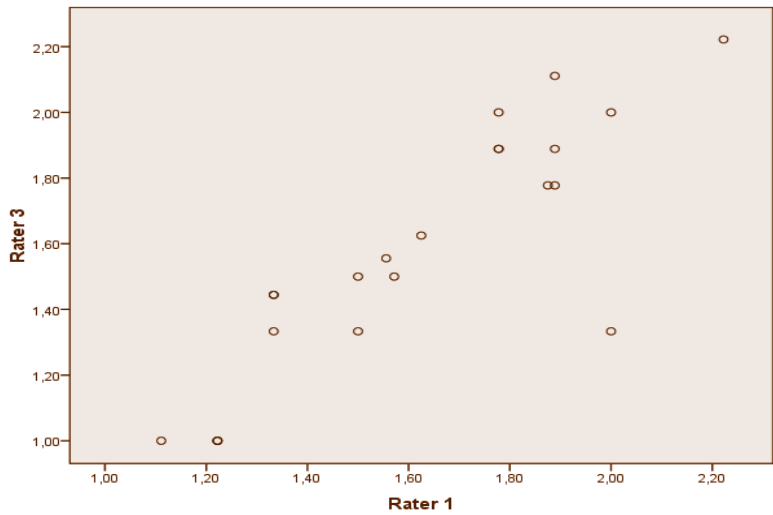
Comparison of results for the control group and the intervention group after training showed that the frequency of “yes” ratings was significantly greater in eight of the ten quality indicators for the intervention group (Table 2).

*Figure 2. Intraclass Correlation to Evaluate the Correlation Between Different Raters of the Interdisciplinary Round Assessment Scale Scores.*

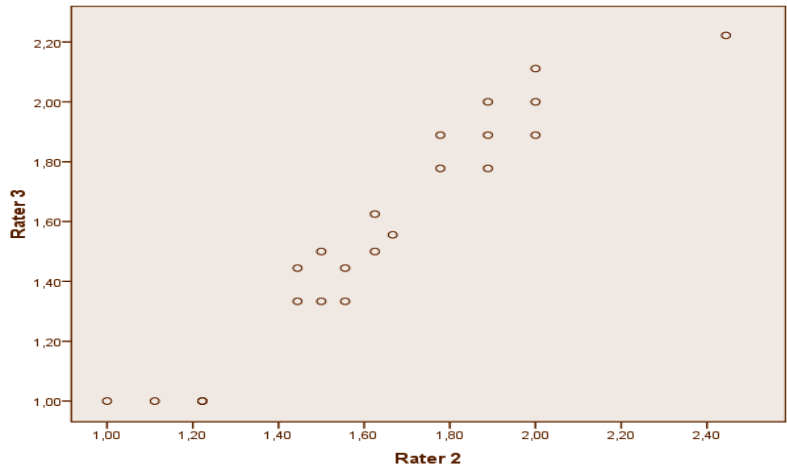


*(A) Score correlations between rater 1 and rater 2 ( $r = 0.83$ ;  $P < .0001$ ).*





(B) Score correlations between rater 1 and rater 3 ( $r = 0.8$ ;  $P < .000$ ).



(C) Score correlations between rater 2 and rater 3 ( $r = 0.94$ ;  $P < .0001$ ).

The average score correlation was measured between pairs of raters: rater 1: intensivist; rater 2: first author and rater 3: ICU nurse. The x and y axes represent average rater scores on all 19 quality indicators.

*Table 2. Effect of Leadership Training of Intensivists on the Interdisciplinary Rounds Assessment Scale\**

SCALE ITEM	Control Interv. $P \leq \dagger$			Interv. Interv. $P \leq \dagger$			Control Interv. $P \leq \dagger$		
PATIENT PLAN OF CARE	(Before)			(Before) (After)			(After)		
1 main problem discussed	59 (60)	58 (59)	NS	58 (59)	94 (94)	.000	59 (60)	94 (94)	.000
2 diagnostic plan discussed	73 (73)	61 (62)	.02	61 (52)	89 (90)	.000	73 (73)	89 (90)	.002
3 goal formulated	52 (53)	36 (36)	.02	36 (36)	79 (80)	.000	52 (53)	79 (80)	.000
4 long-term therapeutic items (> 16 h) discussed	47 (48)	43 (43)	NS	43 (43)	67 (68)	.000	47 (48)	67 (68)	.003
5 greatest patient risk discussed	32 (32)	26 (26)	NS	26 (26)	27 (27)	NS	32 (32)	27 (27)	NS
<b>PROCESS</b>									
6 expectations made clear by consultants	85 (86)	84 (85)	NS	84 (85)	94 (95)	.02	85 (86)	94 (95)	NS
7 input of junior physicians encouraged	41 (41)	59 (60)	NS	59 (60)	79 (80)	.006	41 (41)	79 (80)	.000
8 input of nurses encouraged	66 (67)	72 (72)	NS	72 (72)	86 (87)	NS	66 (67)	86 (87)	.002
9 summary given	38 (38)	40 (40)	NS	40 (40)	57 (58)	NS	38 (38)	57 (58)	.01
10 it is clear who is responsible for tasks	14 (14)	18 (18)	NS	18 (18)	35 (35)	.02	14 (14)	35 (35)	.001

\* Essential indicators of the Interdisciplinary Rounds Assessment Scale: each item was answered with either 1 (no), 2 (doubt), or 3 (yes). The option "not applicable" was not applicable to scale items 1, 3, 9, and 10. Data reported as "number (%) of the yes-rating" (responses of "no," "doubt," and "supportive quality indicators" are not shown). Control and the before and after tests of the intervention group results each included 99 analyzed patient presentations. † Mann-Whitney test; NS, not significant ( $P > .03$ ). Abbreviation: Interv. = intervention

## DISCUSSION

The present intervention study showed that a leadership training program for IDRs improved seven of the ten essential quality indicators of the IDR Assessment Scale from before to after training and the intervention group after training had better performance than the control group in eight indicators. The study was accomplished with minimum load for daily work in the ICU organization because of the use of a simulation environment for training and the real-life setting of the preparation and completion sessions. Furthermore, the sustained effect of the intervention, measured at 6 weeks after the training, suggested that the training effect persisted and that training could be applied to clinical practice.

Despite the importance of leadership, leadership training is limited in the curricula of most medical schools, which emphasize molecular, cellular, and organ-system dimensions of health and disease.<sup>21,28,29</sup> Literature review identified only 1 cohort study about leadership in the ICU environment that measured leadership skills of intensivists and 1 intervention study about collaborative communication of nurse and physician leadership in the ICU with positive side effects on leadership skills.<sup>7,22</sup>

The present study showed that leadership, focussed on leading IDRs, can be reliably trained in a simulated environment. A strength of this study was the use of videotape, which identified issues that may not have been obvious immediately for intensivists.<sup>9</sup> Reviewing videotaped sessions may be more effective in providing feedback and detecting consequences for other team members and the patient's plan of care.

Limitations of the present study included those inherent with a single-center intervention study, such as a limited potential to generalize results. A second limitation concerned the design of the study; the study would have been better balanced if the participants had been allocated randomly to control or intervention groups, and there was no measurement of the control group while they had the list of the 10 indicators. These design issues were necessary for study feasibility. Scenario training in a simulation setting is common in resuscitation education or crew resource management training, but uncommon in learning to lead IDRs.

Another study limitation concerned the level of clinical experience of the two groups, which differed substantially at the beginning of the study. Intensivists of the control group were more experienced but had been trained primarily with the

traditional “see one, do one, and teach one” approach. The participants of the intervention group had fewer years of professional experience as intensivists, but they were more frequently trained by modern training systems, which may have improved the positive results of the leadership training. The improvement also may have occurred, in part, because of their intensive care medicine education which was continuing during the 6 weeks of the study. In addition, the intervention was multifaceted because the preparation and completion sessions were held in the ICU environment but the training was done in a simulated environment; this may have limited the ability to determine which components of training were most important. In personal communication with the first author, the fellows stated that detailed feedback was valuable with a checklist after the videotaped IDR in regular practice and during the training. Before this training, feedback was more random because of a lack of indicators. Furthermore, although the participants had been asked to ignore the videotaping of the sessions, the awareness of being videotaped may have affected the discourse in the study IDRs.

The clinical relevance of a coherent training program to lead an IDR concerns the relation between team leadership and team performance, as suggested previously.<sup>5</sup> Acute care medical teams have a hierarchical structure, and the behavior of intensivists may markedly influence the perception and behavior of other team members.

Improving leadership by training the intensivists may be a useful and less costly intervention to influence team members than training the entire ICU team. This also was confirmed by a recent update about interprofessional education which revealed low evidence that organized team training will improve team performance.<sup>30</sup> Although women doctors may demonstrate less leadership behavior without training, all untrained clinicians, regardless of level of experience or sex, may benefit from a leadership course to improve quality and safety of care.<sup>11</sup>

The leadership training course, guided by the ten essential indicators of the IDR Assessment Scale, was derived from daily practice and hence easily applicable for the raters. The high scores in interrater reliability and intraclass correlation between the raters show that the assessment scoring scale is indeed independent of the professional background of the individual raters.

Further study may include the application of this training program, based on the essential quality indicators as a checklist, to other ICUs or departments in health care,

and it may be necessary to modify the training to further test its general applicability. In addition, it may be helpful to investigate whether feedback for indicators of leading behavior during rounds may generate similar positive results for the control group as noted with the intervention group. It also may be helpful to expand the effect of training leadership skills on the predictive value for outcomes such as staff satisfaction, patient and family satisfaction, or clinical outcomes.

In conclusion, the present study showed that the quality of leadership may be reliably trained and measured for IDRs in ICUs. Leadership behavior may be effectively trained in a simulation environment, with real-life IDR scenarios including conflicting situations and workplace-based feedback in the preparation and feedback phases. This study provides a basis for further work on training leadership in ICUs and determining the effect of leadership training on improving the quality and safety of patient care.

### ACKNOWLEDGMENTS

The authors thank all ICU care professionals who participated in the videotaped sessions. We thank H. Delwig, intensivist of the Critical Care Department, for development of the course scenarios and H.E.P. Bosveld for performing the statistical analysis.

*Conflicts of interest:* The authors have no commercial association or financial involvement that might pose a conflict of interest connected with this article.

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## CHAPTER 5

# MUTUAL AGREEMENT BETWEEN PROVIDERS IN INTENSIVE CARE MEDICINE ON PATIENT CARE AFTER INTERDISCIPLINARY ROUNDS

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*Journal of Intensive Care Medicine, 2013;4:1-6*

**ABSTRACT**

**Purpose:** Insights regarding the results of interdisciplinary communication about patient care are limited. We explored the perceptions of intensivists, junior physicians, and nurses about patient care directly after the interdisciplinary rounds (IDRs) in the intensive care unit (ICU) to determine mutual agreement.

**Methods:** A single-centre survey study adapted from Pronovost's "daily goal sheet" was performed in ICUs for adults at a university medical center. Participants were intensivists, junior physicians, and ICU nurses. This survey, consisting of 14 items, was obtained directly after IDRs. Descriptive statistics of 90 observations of 30 discussed patient plans were computed. The internal consistency of the survey was measured by Chronbach's  $\alpha$  (alpha).

**Results:** Differences between the hypothesized agreement of 90% and the saturated agreement revealed significant differences with 12 of the 14 items between the 3 groups of ICU care providers. Results of the differing agreement between intensivist versus junior physicians or ICU nurses and between ICU nurses versus junior physicians revealed that intensivists tend to agree more with ICU nurses than they do with the junior physicians. Internal consistency showed  $\alpha = 0.74$ .

**Conclusions:** The recommendation of IDRs without mutual agreement in important aspects of patient care hampers safety in daily practice. This study demonstrates that a survey to determine this agreement between the intensivists, junior physicians, and ICU nurses has low agreement, as measured directly after the IDRs.

**KEY WORDS:** Survey, Interdisciplinary communication, Critical Care, Decision Making, Observational design.

## INTRODUCTION

An interdisciplinary round (IDR) is a patient-focused communication system integrating care delivered by specialists from different disciplines.<sup>1,2</sup> The goal is to increase the quality of patient care by sharing information, addressing patient problems, and planning and evaluating treatment.<sup>2</sup> In the intensive care unit (ICU), IDRs are increasingly recommended to support quality improvement and to reduce preventable patient harm and conflicts by clinician encouragement of team member *communication* and contributions to patient *decision-making*.<sup>2-5</sup>

The association between quality of *communication* and patient outcomes is repeatedly demonstrated by retrospective analyses of incidents and adverse-event reports.<sup>3,6-10</sup> Studies of the *decision-making* process have demonstrated that medical knowledge held by doctors continues to remain dominant over areas of knowledge held by nurses.<sup>6,11-14</sup>

The ICU care providers cannot be sure how information about patient care is interpreted. Several studies have described these problems.<sup>7,15,16</sup> Two cohort studies and 1 experimental study (testing situational awareness after rounds) have been published. Two of these have focused on understanding daily patient goals and 1 has focused on team members' perceptions of whether patients would deteriorate in 48 hours.<sup>7,15,16</sup>

A single-centre survey among intensivists, junior physicians, and ICU nurses was performed to test the range of agreement regarding patient care after IDRs.

## METHODS

### Study design

This study was performed in an intensive care department with a closed format for adults, during April and May, 2011 in the University Medical Center in Groningen, the Netherlands. The intensive care department includes cardiac, medical, surgical, and neurologic ICUs, and admits approximately 3,000 patients per year. In all units, daily IDRs are organized separate from morning rounds or reports at the changes of shifts, and are directed by the Dutch National Committee for Quality Visitation of Intensive Care. This committee establishes a visitation committee per visitation consisting of 2 intensivist, 2 ICU nurses, a chairman and 1 reporter per visitation. A visitation consists of a questionnaire, a review of relevant documents, a department tour and interviews

with care providers or staff representing different levels of responsibilities related to the respective department. The visitation and the results are confidential.

In a typical IDR, which starts on all units at 11:00 AM, the care of all patients is discussed within 120 minutes. The IDRs are lead by intensivists; junior physicians give clinical patient presentations, and bedside nurses and specialist consultants give additional relevant information. The presence of specialist consultants varies with each patient and includes surgeons, cardiologists, nephrologists, neurologists, and infectious diseases specialists.

### The survey

Our survey was adapted from the checklist of Pronovost's "Daily Goals Form"<sup>15</sup> for 3 reasons, (1) its items specify goals, potential risks, and variables that ICU care providers focus on;<sup>17</sup> (2) the study was (modified) retested;<sup>18</sup> and (3) it contained components identified in other checklists.<sup>15, 19, 20</sup>

The items of this survey were further modified by asking critical care physicians and nurses where it was necessary to reduce ambiguity. After 2 IDRs, the survey was slightly revised based on their feedback. This revision improved clarity; however, it increased the burden for the intensivists, as they also had to complete the survey instead of validating the answers of the junior physicians and ICU nurses about patient care. The revised survey was further applied to the 3 groups of ICU care providers—the intensivists, junior physicians, and nurses.

The survey consisted of 14 different questions, namely 8 "open questions," 1 question with multiple answer possibilities" and 5 "closed questions." The closed questions used "yes," "no" or "not applicable with this patient" answers (see Table 1). The first 4 questions reflect the perception of ICU care providers on patient condition. The remaining 10 questions reflect the presumed monitoring of respiration, circulation, laboratory tests, sedation, and how to manage the ranges of respiration, circulation, laboratory tests and sedation.

Table 1. The Survey

Please circle your discipline: Intensivist/ Junior Physician/ICU nurse

The bed number of the patient:

1	What is the main problem?
2	What is/are the secondary problem(s)?
3	What is the patient's greatest risk?
4	What is the (provisional) goal for the next 24 hours?  Please circle the following options (if appropriate): - Stabilizing hemodynamic status - Dehydration - Weaning of ventilation - Diagnostic - End of life care - Other, namely.....
5	Are indicators determined for monitoring ventilation? Yes/No/Not applicable
6	What is decided about the management of the ranges of ventilation?
7	Are indicators determined for hemodynamic monitoring? Yes/No/Not applicable
8	What is decided about management of the ranges for the hemodynamic status?
9	Are indicators determined for blood gas monitoring? Yes/No/Not applicable
10	What is decided about what the management of the ranges for blood gas analysis?
11	Are indicators determined for monitoring laboratory tests? Yes/No/Not applicable
12	What is decided about the management of the ranges for laboratory tests?
13	Are indicators determined for monitoring sedation? Yes/No/Not applicable
14	What is decided about the management of the ranges for sedation?

### Participants

The survey was given after 5 IDRs in 4 different ICUs to 5 intensivists, 14 junior physicians, and 45 ICU nurses. Junior physicians rotated every 3 months, and their experience varied from 2 weeks up to almost 3 months. No demographic information was collected. All participants were informed about this list during ward and staff meetings before the IDRs took place. During the 5 IDRs, approximately 52 patients were discussed, and each of the intensivists and junior physicians was asked to complete the survey for each patient directly after the IDRs. The ICU nurse was asked to complete the survey after the patient was discussed in the meeting room. They were allowed to check their notes or patient record while completing the survey. The number of surveys administrated was 156 (ie, 3 per ICU patient: 1 for the intensivist, 1 for the junior physician, and 1 for the ICU nurse).

### Statistical analysis

Descriptive statistics (frequencies and categorical variables) were computed for the quantitative data. The frequency of agreements between the ICU care providers consisted of 5 categories: (1) no agreement between the 3 groups of ICU care providers, (2) agreement between the junior physician and the nurse, (3) agreement between the intensivist and the nurse, (4) agreement between the intensivist and the junior physician, and (5) overall agreement between the 3 groups of ICU care providers.

To test the results of the survey between the hypothesized agreement and the saturated agreement, we used the chi-square test<sup>1</sup> The hypothesized agreement is: "All 3 groups of ICU providers agree with each other 90% of the time (27 of the 30 patients) on each question after the IDR."<sup>21</sup> This test uses descriptive statistics of data and compares the range of agreement of frequencies and categorical variables of each question.<sup>21</sup> Significant outcomes imply deviance from the hypothesized agreement, while non-significant outcomes imply more overall agreement between the 3 groups of ICU care providers.

*Internal consistency* was measured with Chronbach's  $\alpha$  (alpha), a statistically calculated correlation of coefficients between indicators where the extent of several items measure a certain concept. Internal consistency ranges between 0 and 1.<sup>22</sup>

## RESULTS

Of the 156 administrated surveys regarding 52 patients (i.e. 3 per ICU patient: 1 for the intensivist, 1 for the junior physician, and 1 for the ICU nurse), we received 134 (86%) completed surveys. Both intensivists and ICU nurses filled out 52 surveys each, regarding 52 patients. The junior physicians completed 30 surveys, regarding 30 patients. To determine the range of agreement among intensivists, junior physicians, and nurses regarding the same ICU patient, 90 completed surveys by all three groups (60%) (about 30 ICU patients) were analyzed (ie, 3 observations per patient).

*Internal consistency* of the survey by Chronbach's  $\alpha$  (alpha) demonstrated acceptable results with  $\alpha = 0.78$  for the survey.

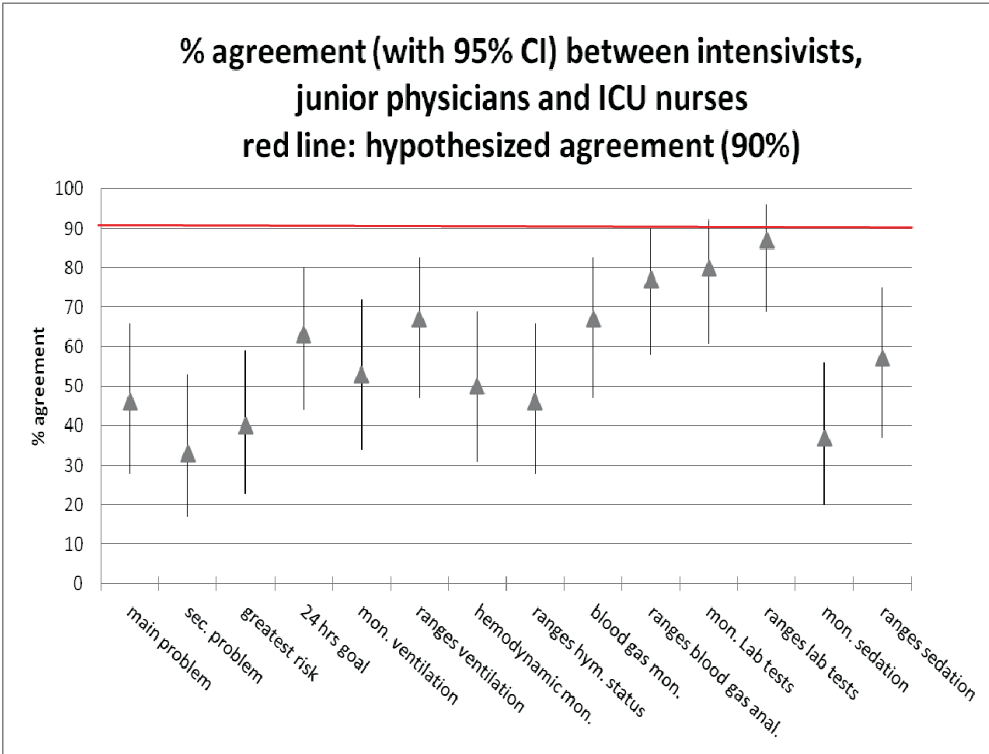
Figure 1 demonstrates the range of agreement between the hypothesized and saturated model. In Figure 2, we show the frequency scores between 1, 2, or 3 groups of ICU providers. These statistical results are discussed below.

### Results of agreement of the main, secondary problems, risks, and goals

The first 4 questions: "What is the main problem?" "What is/are the secondary problem(s)?" "What is patient greatest risk?" and "What is the (provisional) goal?" reflect the perception of the 3 groups of ICU providers on the condition of the 30 ICU patients. Differences between the hypothesized agreement of 90% and the saturated agreement reveal significant differences among all 4 questions between the 3 groups of ICU care providers (Figure 1).

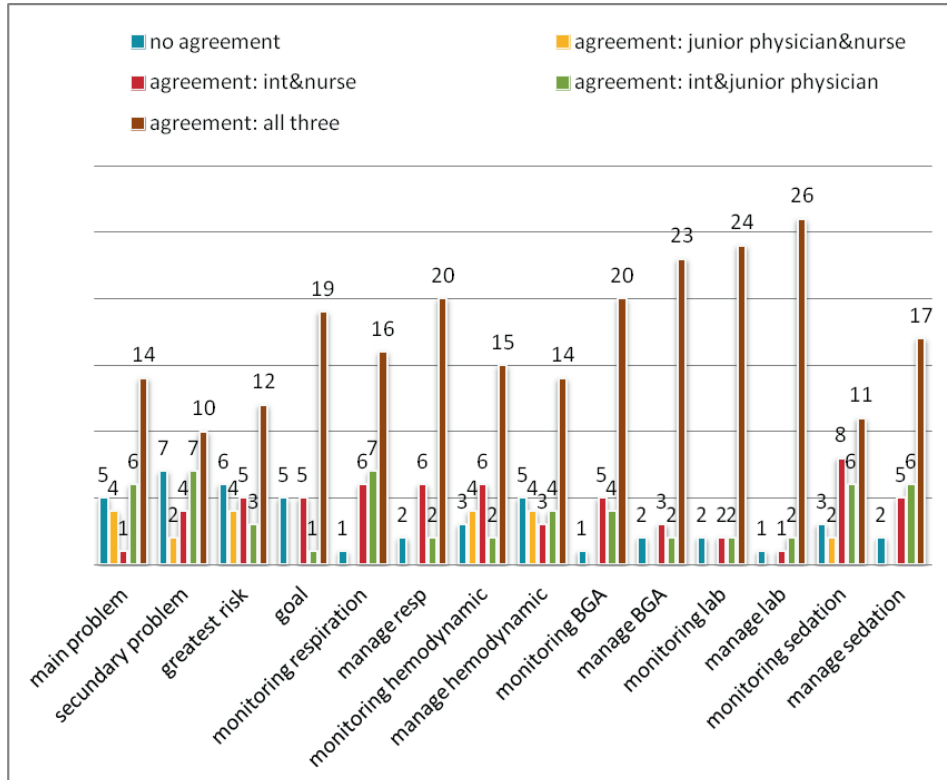


*Figure 1. Percentage of Agreement (With 95% Confidence Interval) Between Intensivists, Junior Physicians, and Intensive Care Unit Nurses, With 30 Care Plans*



With regard to the frequencies of the 5 agreements categories, Figure 2 shows that frequencies of agreement regarding main and secondary problems are, not significant, higher between junior physicians and intensivists. The frequencies of the questions regarding greatest risk and goal showed a higher, not significant, agreement between the intensivist and the ICU nurse.

Figure 2. Differing Agreement Regarding 30 Care Plans After Interdisciplinary Rounds in the Intensive Care Unit



Results of agreement regarding monitoring and management of respiration, circulation, laboratory tests, and sedation.

The other 10 questions reflect the agreed monitoring and how to manage the ranges of respiration, circulation, laboratory tests, and sedation. Differences between the hypothesized agreement of 90% and the saturated agreement reveal significant differences with 8 of the 10 questions between the 3 groups (Figure 1) regarding “Monitoring ventilation,” “Management of the ranges of ventilation,” “Hemodynamic monitoring,” “Management of the ranges for the hemodynamic status,” “Blood gas monitoring,” “Management of the ranges of blood gas analysis,” “Monitoring sedation,” and “Management of the ranges for sedation.” The other 2 questions

regarding “Monitoring laboratorial tests,” and “Management of the ranges of laboratory tests” show differences, although not statistically significant.

Frequencies of (no)-agreement differed per question, per patient, and per ICU care provider (Figure 2). There was a large amount of overall agreement on 3 questions: “What is decided about the management of the ranges for blood gas analysis?” (with 23 of the 30 patients), “Are indicators determined for monitoring laboratory tests?” (with 24 of the 30 patients), and “What is decided about the management of the ranges for laboratory tests?” (With 26 of 30 patients). Figure 2 shows that with respect to these 10 questions, intensivists did agree more with ICU nurse than with junior physicians on the following 5 questions namely “Management of the ranges of ventilation,” “Hemodynamic monitoring,” “Blood gas monitoring,” “Management of the ranges for blood gas analysis” and “Monitoring sedation.” Intensivists and junior physicians did agree more with each other on “Monitoring ventilation”, “Management of the ranges for the hemodynamic status”, “Monitoring laboratory tests”, “Management of the ranges for laboratory tests” and “Management of the ranges for sedation”.

## DISCUSSION

The IDRs support improved quality of patient care in the ICU. However, IDRs are time-consuming, and insights into the perceptions and mutual agreement of the ICU care providers regarding patient care are limited. This study resulted in a survey that explored perceptions to determine agreement between intensivists, junior physicians, and ICU nurses. The survey revealed significant differences between the hypothesized agreements of 90% and the saturated agreement in 12 of 14 questions. When there was great overall agreement, we attributed this to the fact that the ICU care providers were certain that this item was not applicable with the particular patient.

In situations such where IDRs took place in the ICUs, determining mutual agreement is important because IDRs are complicated by diversity in perception, educational background, and the responsibility of team members and consultants. So far, studies on interdisciplinary communication during IDRs have predominantly investigated overall satisfaction of communication, the decision-making process, and the use of checklists. To our knowledge, this is the first study to determine mutual

agreement on important aspects of patient care that evaluate goals and the process of IDRs to improve patient care.

This survey is simple to apply after IDRs to compare agreement among several groups of ICU providers. However, as with other observational studies, there is a trade-off between providing a full analysis of perceptions and the resulting agreement, making the survey and its analysis of the results simple enough for practical use.

This study is limited in that it was done at a single centre and lacks therefore generalizability. Another limitation consists of the fact that some junior physicians did not fill out the questionnaires despite their commitment. The care plans of the 30 included patients covered the complexity of the 22 care plans who were not accompanied by filled out questionnaires. Also the time of professional experiences of the junior physicians who filled out the questionnaires covered the time of experiences by those who did not filled out the questionnaires. The authors did not ask for clarification with the non-responding junior physicians. The third limitation is that ICU providers were not familiar with these questions. Recurrence of this survey might generate other results.

Although open questions suggest difficulties in comparing answers, this was not the case, as these open questions all were related to a specific patient and could be unambiguously rated.

Previous studies stipulate the importance on daily patient goals. Unifying a goal might be helpful in removing traditional hierarchical barriers between nurses and physicians, because the focus would be less on individual achievement and more on collaborative effort.<sup>23,24</sup> Comparative studies in (pediatric) ICUs have confirmed positive results; when team members *understand* patient daily goals better, then patients stay for a decreased time in the ICU.<sup>7,25</sup> By testing whether team members understand the daily goals, the authors felt that questioning “What is the daily goal?” might generate a more reliable answer than asking whether they understand the goal.

Previous results show that in a recent survey of 323 ICUs in 24 countries, up to 70% of ICU workers reported deleterious conflicts.<sup>5</sup> Regular staff meetings, joint symptom-control management between doctors and nurses, and effective communication emerged as tools to achieve improvement. Regarding the agreement in this study, conflicts arose owing to different perceptions of patient care. Another reason for conflicts in the ICU may be related to the fact that the ICU nurse frequently

had to consult with the junior physicians, first, when patient problems occurred. Our study shows a discrepancy between the ICU nurse and the junior physicians regarding perceptions about the patient condition and the patient plan of care. Overall, intensivists and ICU nurses tended to agree with each other.

A key issue arising in studies about decision making concerns the fact that while the nurse's role in the ICU has changed, this has had little effect on how clinical decisions are made. There is a hierarchy in clinical knowledge, whereby medical knowledge dominates nurses' knowledge, except when patient illnesses are understood or the predicted risk of a negative outcome for the patient is less.<sup>4,14,26</sup> This survey showed that intensivists and ICU nurses agree more frequently with each other; this hierarchy of clinical knowledge could be reconsidered based on *clinical expertise*, which appears to be an important component of patient care teams.<sup>27</sup>

The ICU management and staff may perform IDRs because they presume that IDRs support quality improvement. Therefore, it is relevant to ask critical questions when evaluating IDRs. The ICU care providers who completed the survey considered their IDRs to be adequately performed, and they did not realize that there were differences in perception and agreement. Regarding decision-making, it might be better first to carefully test perceptions and agreement with each other before striving for shared decision making.

Finally, replicating the study elsewhere would be necessary to further evolve the survey and establish generalizability. We await these studies, and despite this diversity, some findings of our study may apply to other ICU settings.

## CONCLUSIONS

Interdisciplinary rounds that do not clearly agree on critical aspects of patient care may hamper improvement of the quality of patient care in the ICU. This study demonstrated that a simple survey to determine the range of mutual agreement between the intensivists, junior physicians, and ICU nurses shows low agreement with patient care (as measured after interdisciplinary rounds). The survey offers feedback for ICU professionals and managers about adjustments in IDRs. Testing the survey in other ICUs may be required to further evolve and validate the general usefulness of this survey.

**ACKNOWLEDGEMENTS**

We would like to thank the ICU care providers who completed this survey. We thank J.E. Tulleken, MD, PhD, Training Course Director of the Department of Critical Care for the general support. We thank H.E.P. Bosveld for performing the statistical analyses.

**Declaration of Conflicting Interests:** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding:** The author(s) received no financial support for the research, authorship, and/or publication of this article.

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## CHAPTER 6

# ASSESSING THE QUALITY OF THE LONG-TERM PATIENT DISCUSSION DURING INTERDISCIPLINARY ROUNDS IN THE INTENSIVE CARE UNIT

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**ABSTRACT**

In the thoracic intensive care unit (ICU), efficient patient turnover is important to ensure availability of beds for elective and emergency admissions. However, when an unexpected, unpredictable, or unusual course of disease occurs, it may be difficult to address inadequacies of care or system failures which may lead to a prolonged length of stay.

Recent studies showed an association between patient outcomes and the quality of interdisciplinary communication in the ICU. Therefore, we conducted a study that assessed the quality of care plans of the long term patient (>10d), discussed during videotaped interdisciplinary rounds (IDRs) in the thoracic ICU with the 'plan of care' domain of the recently developed IDR Assessment Scale.

First, the mean Acute Physiology and Chronic Health Evaluation (APACHE) IV score was tested which showed a higher score for long-term than short-term patients.

Validity of the 'plan of care' domain was examined by 1) interrater reliability, 2) internal consistency and 3) factor analysis. Validity tests demonstrated that factor analysis found all factor loadings on two domains > 0.65; the interrater reliability among 3 raters was satisfactory (kappa, 0.73) and the internal consistency was within acceptable ranges ( $\alpha$ , 0.69).

Assessing the quality of the discussed care plan of the long-term patient during IDRs in the thoracic ICU demonstrated significantly lower frequency of yes ratings for the long-term than short-term patients for the quality indicators 'main problem discussed' and 'goal formulated'.

## INTRODUCTION

Despite improvements in diagnostics and treatment options for patients in modern health care, patients may have inexplicable variations in quality of care received.<sup>1</sup> In the intensive care unit (ICU), inadequate standards of care may cause adverse events that may prolong ICU stay. In addition, prolonged ICU stay may be caused by ventilator dependency, serious infectious diseases, and neuromuscular weakness.<sup>2-5</sup> Prolonged length of stay has a negative effect on patients and families, available resources, and bed utilization.<sup>3-7</sup>

In thoracic and surgical ICUs, efficient patient turnover is important to ensure availability of beds for elective and emergency admissions.<sup>4,8-11</sup> When an unexpected, unpredictable, or unusual course of disease occurs, it may be difficult to address inadequacies of care or system failures.<sup>12</sup> Nevertheless, a lengthy remaining ICU stay more than 5 days, may alert ICU clinicians to carefully reconsider the plan of care.<sup>10</sup>

In addition to technical developments within critical care, other studies showed an association between the quality of interdisciplinary communication of health care providers and patient outcomes.<sup>11;13-17</sup> Research regarding interdisciplinary communication about the long-term patient is limited because of related concepts such as end of life decision making or quality of life care.<sup>18-21</sup> Literature search showed no study about the content of interdisciplinary communication about the care plan of long-term ICU patients.

We therefore conducted a study that focused on interdisciplinary communication during interdisciplinary rounds (IDRs) in the ICU about the long-term ICU patient (>10 d).<sup>4</sup> An IDR is defined as a patient-centered communication session to integrate care delivered by specialists from different disciplines.<sup>22-24</sup> Well performed IDRs are recommended in the ICU because ineffective interdisciplinary communication among medical teams may cause preventable patient harm and severe conflicts within ICUs.<sup>15;25-28</sup>

To assess the quality of the interdisciplinary communication of the care plan of the long term patient, we tested and used the 'Plan of care' domain, including 8 quality indicators, of the recently developed IDR Assessment Scale.<sup>23;24</sup> This domain reflected the technical performance from the initial identification of a patient-related goal to the evaluative phase and had been developed after extensive reviewing of literature and analyzing videotaped IDRs in the ICUs by Delphi Rounds.<sup>23</sup>

The principal aim of this study is to test the 'Plan of care' domain of the IDR Assessment Scale to discuss the care plan of long-term patients during IDRs. And subsequently, to assess the quality of the care plan of long-term patients (>10d) as discussed during IDRs in the thoracic ICU. We also describe the outcomes compared with short-term patients (< 10 d).

## **MATERIAL AND METHODS**

### Study design

This single center quantitative study was performed in the thoracic ICU, which was 1 of 4 adult ICUs at the University Medical Center, Groningen, the Netherlands. The thoracic ICU had 14 beds, admitted approximately 1000 patients per year, and employed 7 experienced intensivists, 3 ICU fellows, 8 junior physicians, and 80 ICU nurses. Indications for elective and emergency admission included cardiac valve replacement, coronary artery bypass grafting, cardiac arrest, or lung transplantation procedures. In the thoracic ICU, daily IDRs were organized separate from morning rounds or reports at changes of shifts. In a typical daily IDR, discussions occur away from the bedside about the care plans of the 14 ICU patients (total, 120 min). The IDRs were directed by intensivists; junior physicians gave clinical patient presentations; and bedside nurses and consultants gave additional relevant and current information. Specialist consultants included cardiologists, thoracic surgeons, and infectious diseases specialists. The plan of care, determined by the leading intensivist, was designed to be agreed, understood, and executed by all involved care professionals in the ICU.

During the data collection period in 2011, 11 IDRs led by 5 different intensivists were videotaped. The Acute Physiology and Chronic Health Evaluation (APACHE) IV score was daily determined by physicians for each patient as previously described.<sup>29</sup> A sampling of APACHE IV scores during 2011 of the thoracic ICU was obtained and long-term and short-term patients were compared.

The Medical Ethical Testing Committee of the University of Groningen waived Institutional Research Board approval for videotaping IDRs in the ICU because the study design was observational and study subjects were staff members, not patients. All participants gave formal approval for videotaping the IDRs.

### The domain 'Plan of care' of the IDR Assessment Scale

The quality indicators of the domain 'Plan of care' of the IDR Assessment Scale were constructed on patient level in order to assess multiple patients with multiple conditions (Table 1).<sup>23,30,31</sup> The indicators fostered an interdisciplinary approach because the execution and team compositions of IDRs may differ between the ICUs. All indicators were associated with improved outcomes, statistically tested and described in terms of observable behavior.

To confirm that these indicators corresponded to an appropriate assessment of interdisciplinary communication about the care plan of the long-term patient, we compared the indicators with a literature search about the long-term patient in the ICU.<sup>18-21</sup> In addition, the indicators were checked by asking critical care physicians and nurses where it was necessary to reduce ambiguity. In both situations, no additional indicators were considered useful to assess the quality of the care plan of the long-term ICU patient.

The quality indicators of the 'Plan of Care' domain were essential (5 indicators) or supportive (3 indicators).<sup>23</sup> Confirmation of a well discussed plan of care was reached when the essential quality indicators were rated as "yes" or "not applicable".<sup>23</sup> There were 6 quality indicators that had a "not applicable" option when the indicator could not be rated. The "not applicable" option was incorporated because indicators as diagnostic plan discussed, long term interventions discussed, and patient greatest risk discussed, may not be applicable in case of end-of-life palliative care consultation or discharge from the ICU.

**Table 1.** Definitions of the 8 Quality Indicators of the Patient Plan of Care Domain of the Interdisciplinary Rounds Assessment Scale\*

<u>Quality Indicator</u>
1. <i>Main problem discussed.</i> Verbal identification of the (provisional) main problem according to patient response to treatment; may be same as indication(s) for admission to the ICU.
2. <i>Diagnostic plan discussed.</i> Discussion of interventions (laboratory tests, computed tomography scans, radiographs, or consultations with other consultants) to determine diagnosis or exclude specific problems or complications.



3. *Provisional goal formulated.*

What needs to be done to get this patient to the next level of care or discharged from the ICU?

4. *Long-term therapeutic items (> 16 h) discussed.*

5. *Patient's greatest risk discussed.*

The risk of a widespread or serious complication that can occur because of circumstances from the patient, therapy, or ICU stay; may be same as indication(s) for admission to the ICU.

6. *Secondary problems discussed.*

*Secondary problems that are derived as a consequence of the (presumed) main problem, treatment, or ICU stay, or a secondary diagnosis.*

7. *Plan of care for secondary problems discussed.*

*The plan that is based on identified secondary problems, including primary or secondary goals and procedures.*

8. *Short-term therapeutic items (< 16 h) discussed*

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*\*Adapted from Ten Have et al.<sup>23</sup>. Abbreviation: ICU, intensive care unit.*

### Training of raters for assessment

The quality indicators were described in terms of observable behavior that was explained in a manual necessary for using this instrument (definitions extracted of this manual were shown in Table 1). Raters were trained by assessing videotaped patient presentations that were led by different intensivists in varied ICU settings. An assessment was performed to determine interrater reliability and whether definitions were applied uniformly. When evaluation of interrater reliability showed kappa  $\geq 0.70$ , the training was considered effective and the raters were allowed to rate other patient discussions.<sup>32</sup>

The trained raters qualified their observations with the definition of the quality indicator using a 3-point scale that indicated whether the behavior occurred during each patient discussion: 1, no (the behavior was not observed); 2, doubt/inconsistent (verbalizations or behaviors were inconsistent with the quality indicator); or 3, yes (the behavior was clearly observed and consistent with the quality indicator).

### Statistical analysis

The *t* test (1-sided for groups with unequal variance) was used to evaluate differences in APACHE IV score between the long-term and short-term patients.

Validity of the checklist was tested by 1) interrater reliability, 2) internal consistency and 3) factor analysis.<sup>33</sup> Interrater reliability was tested by 3 raters who examined the indicators in 9 randomly selected patient presentations.<sup>32;34;35</sup> Internal consistency of the checklist was measured with Cronbach  $\alpha$ . An exploratory factor analysis using rotation method Varimax with Kaiser Normalization was performed.<sup>23</sup>

## RESULTS

Long-term patients had a significant higher APACHE IV score and a significant higher predicted mortality than short-term patients (Table 2).

**Table 2.** *Characteristics of Patients Treated in the Thoracic Intensive Care Unit\**

<b>Patients in year 2011</b>	<b>Long-term</b>	<b>Short-term</b>
No. patients	106	895
Mean length of ICU Stay (d); (Median); [Range]	24.9 ; (19.5); [10 to 83]	2.5; (2); [1 to 9]
Mean age (y); (Median); [Range]	62 ; (65.5); [17 to 83]	63.7; (66); [13 to 92]
No. admissions (planned/ emergency)	53/53	727/168
APACHE IV score <sup>†</sup> ; (Median)	65.5 ; (63) <sup>§</sup>	44.6 ; (41) <sup>§</sup>
Hospital mortality % (Median)	16 ; (7.4)	5 ; (1.1)

\* Data reported as number, mean (median) [range, minimum to maximum].

Abbreviation: ICU, intensive care unit.

<sup>†</sup> APACHE IV, Acute Physiology and Chronic Health Evaluation IV score

<sup>§</sup> Difference in APACHE IV score between long-term and short-term patients during data collection period is significant:  $P < .00001$ .

Validity tests of the checklist demonstrated that the interrater reliability among 3 raters was satisfactory (kappa, 0.73) and the internal consistency was within acceptable ranges ( $\alpha$ , 0.69).<sup>34</sup> The exploratory factor analysis found all factor loadings on two domains  $> 0.65$  (Table 3).

**Table 3.** Exploratory Factor Analysis of the Quality Indicators of the “Patient Plan of Care” Domain of the Interdisciplinary Rounds Assessment Scale in Clinical Scenarios in the Intensive Care Unit\*

**Rotated Component Matrix<sup>a</sup>**

	<b>Quality indicator of ‘plan of care’ domain</b>	<b>Factor loading</b>	<b>Factor loading</b>
1.	Main problem discussed	<b>.917</b>	.190
2.	Diagnostic plan discussed	<b>.897</b>	.254
3.	Provisional goal formulated	<b>.975</b>	.112
4.	Long-term therapeutic items (> 16 h) discussed	<b>.797</b>	-.062
5.	Patient greatest risk discussed	<b>.668</b>	.305
6.	Secondary problems discussed	.051	<b>.925</b>
7.	Plan of care for secondary problems discussed	.553	<b>.701</b>
8.	Short-term therapeutic items (<16 h) discussed	-.116	<b>.928</b>

\* Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization

Assessment of the quality of the discussed care plans of the long-term and short-term patient demonstrated that frequencies of “yes” rating about the long-term patients were less than 50% about the essential indicators (Table 4). There was a significantly lower frequency of yes ratings for the long-term than short-term patients for 2 quality indicators (main problem discussed and [provisional] goal formulated). There was a significantly higher frequency of yes ratings for long-term than short-term patients for 1 quality indicator (plan of care for secondary problems discussed).

**Table 4** Application of the 8 Quality Indicators of the Patient Plan of Care Domain of the Interdisciplinary Rounds Assessment Scale in Clinical Scenarios in the Thoracic Intensive Care Unit \*

Quality Indicator	Long-term Patients (> 10 d)	Short-term Patients (< 10 d)	$P \leq ^{\dagger}$
No. discussions about patients	57	41	---
<b>1. Main problem discussed<sup>‡</sup></b>	24 (42)	31 (76)	.05
<b>2. Diagnostic plan discussed<sup>‡</sup></b>	17 (30)	13 (31)	NS
<b>3. (Provisional) goal formulated<sup>‡</sup></b>	18 (32)	26 (63)	.004
<b>4. Long-term interventions (<math>\geq 16</math> h) discussed<sup>‡</sup></b>	28 (49)	17 (41)	NS
<b>5. Patient's greatest risk discussed<sup>‡</sup></b>	4 (7)	5 (12)	NS
6. Secondary problems discussed	53 (93)	37 (90)	NS
7. Plan of care for secondary problems discussed	36 (63)	24 (58)	.03
8. Short-term (< 16 h) interventions discussed	50 (88)	37 (90)	NS

\*  $N = 98$  discussions assessed with the checklist: each item was answered with either 1 (no), 2 (doubt) or 3 (yes). Some indicators had the option "not applicable," but not items 1 and 3. Data are reported as number (% of yes rating); responses of no, doubt, or not applicable are not shown. Abbreviation: ICU, intensive care unit.

<sup>†</sup>NS, not significant ( $P > .05$ )

<sup>‡</sup>Essential indicators determined by factor analysis are shown in bold text.

## DISCUSSION

In the present study, we tested and assessed the 'Patient plan of care' domain of the IDR Assessment Scale on discussing the care plan about the long-term patient during IDRs in a thoracic ICU. The results confirmed usability, reliability, and internal consistency of the domain.

Explicit communication with defined criteria about the long-term patient is especially important to address the unexpected, unpredictable, and unusual response of the patient to treatment. Therefore, quantitative assessment is needed because it may help identify important aspects of the plan of care that otherwise may not be clarified.

A strength of the 'Plan of care' domain used in the present study is that the list is short enough to be applied to clinical practice and that it can structure interdisciplinary communication about the long-term patient. This may focus the divergent perceptions present between ICU care professionals. In addition, external raters may use these quality indicators as an observation list for videotaped or non-videotaped IDRs. The 'Plan of care' domain may provide a sufficiently analysis of the discussed plan of care for long-term ICU patients.

Limitations of the present study include the single centre design, which may confines the general application of the results to other clinical settings. In addition, the leading physicians were surprised by our results in the idea that all relevant indicators were discussed during their chair. Familiarity with the checklist may have generated other outcomes. Furthermore, there was no assessment of the scores for predictive value for any type of patient outcome, such as length of stay.

Clinical relevance of the present study is emphasized by the significant higher APACHE IV score and significant higher predicted mortality by long-term patients as compared to short-term patients. The present study extends the available knowledge about important aspects of the plan of care of the long-term patient, such as the determination of the main problem, evaluation of goals, and determination of long-term interventions. This may include palliative care options for patients who have treatment goals that are not achieved despite advanced supportive technology.<sup>36;37</sup> The efficiency of the ICU care, the well-being of patients and family members, and the ethical delivery of care may improve.<sup>38</sup>

Previous studies of 323 ICUs in 24 countries showed that 70% ICU workers report deleterious conflicts.<sup>25;39</sup> Regular staff meetings, joint symptom-control treatment between doctors and nurses, and effective communication may improve this problem. In the present study, miscommunication may arise because of different content of discussions about patient care plan. The use of the domain 'Plan of care' by

ICU care professionals about interdisciplinary communication of the long-term patient may decrease miscommunication by improving clarity in discussions.

Future studies may evaluate whether the use of the quality indicators of this domain to guide important aspects of the plan of care of the long-term patient can be sufficiently sensitive to support quality improvement. The domain may evolve with further study and may support ICU care professionals by providing feedback for quality improvement.

In conclusion, quality of patient care and resource use may improve when ICU care professionals clearly address important aspects of the plan of care of long-term patients. The checklist used in the present study may be applicable to daily ICU care and may provide useful feedback for ICU care professionals and managers. This may promote timely adjustments of treatment plans for the long-term patient. Further study may include testing the checklist in other ICUs to evaluate the general application.

## **ACKNOWLEDGEMENTS**

The authors thank all ICU professionals who consented to being videotaped for this study. We thank Prof. dr. Robert C. Wagenaar<sup>†</sup> for the design of the study. We thank dr. Henk E.P. Bosveld for performing the statistical analysis.

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## CHAPTER 7

### GENERAL DISCUSSION

# WELL PERFORMED INTERDISCIPLINARY ROUNDS AS A STRATEGY TO INCREASE QUALITY OF CARE IN THE INTENSIVE CARE UNIT?

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*OA Critical Care 2013, August 1(2);12:1-5*

**ABSTRACT**

An interdisciplinary round (IDR) is a patient-focused communication system aimed at agreeing upon, understanding and executing the appropriate plan of care for the patient by specialists from different disciplines. In the intensive care unit (ICU), IDRs are increasingly recommended because ineffective interdisciplinary communication among medical teams is a leading cause of preventable patient harm and a source of severe conflicts.

In recent years, ICU management and staff have conducted these IDRs by bringing different disciplines in the same meeting to discuss diagnosis and disease management of the ICU patient. Nevertheless, it proves difficult to adequately perform these meetings, because each profession within the ICU has a unique perspective and professional culture. Previous studies about IDRs were in particular survey studies, which described the differences between doctors and nurses regarding status/authority, gender, training and patient care responsibilities. We therefore developed performance improvements, based on: 1) 60 videotaped IDRs, 2) literature reviews, and 3) Delphi Rounds, aimed at supporting and increasing the quality of performance in IDRs.

We discuss here the applications of these performance improvements with reference to processes within IDRs as a strategy for improving ICU care.

**KEY WORDS:** Multidisciplinary Communication, Checklist, Quality Indicators, Video, Intensive Care Unit, Leadership.

## INTRODUCTION

The implementation of interdisciplinary teams in the intensive care unit (ICU) to provide patient-centered care has focused attention on the relevance of interdisciplinary communication. Previous studies have shown that if communication, teamwork, and problem solving among ICU staff is of inferior quality, this may lead to poor understanding of shared goals and worse patient outcome.<sup>1-3</sup> In these situations, vigorous efforts are needed to critically examine and increase the quality of care and teamwork within ICU teams. Meaningful and sustained improvement of ICU performance requires a systems-oriented approach via a persistent process of studying and changing the ICU structures and processes. This approach involves the following steps: 1) measuring relevant indices of ICU performance, 2) making interventions aimed at improving performance, and 3) re-measuring the indices to document the effect of the intervention.<sup>4</sup>

In recent years, interdisciplinary rounds (IDRs) in the ICU were considered to be important to support quality improvement in patient care. For this reason, IDRs in the ICUs are endorsed by the Society of Critical Care Medicine.<sup>5</sup> An interdisciplinary round (IDR) is a patient-focused communication system aimed at agreeing to, understanding and executing the appropriate plan of care for the patient by specialists from different disciplines.<sup>6-8</sup> IDRs reflect the main processes within the ICU, such as the continuity of care, information transfer, teaching obligations and effective communication and planning within the team.<sup>9,10</sup>

Since there is no gold standard for well performed IDRs, the quality of IDRs vary because rounds are complicated by factors including limited time, multiple targets, patient instability, highly technical therapies, and varied responsibilities of different providers.<sup>5,11-14</sup> After extensive reviewing of literature and analyzing videotaped IDRs by Delphi Rounds, we developed a new tool, the IDR Assessment Scale, which includes a gold standard. In this tool nineteen quality indicators of the IDR Assessment Scale are subdivided into two domains, namely 'Patient Plan of Care' and 'Process'. The 'Patient Plan of Care' domain reflects the technical performance from the initial identification of a patient-related goal through the evaluative phase. The 'Process' domain reflects the ICU processes that are important to ensure that the appropriate plan of care is agreed upon, understood, and performed as planned by all involved caregivers. Ten out of 19 quality indicators are *essential*/indicators. To meet the gold

standard for well performed IDRs in the ICUs, these essential indicators need to be rated 'yes' or 'not applicable'.<sup>7</sup>

Development of the IDR Assessment Scale, including the gold standard and the survey, was a starting point for several performance improvements in IDRs in multiple studies.<sup>6-8</sup> In this review, we discuss the application of these tools, and the potential for performance improvements in IDRs in general ICUs.

### **1) MEASURING RELEVANT INDICES OF ICU PERFORMANCE**

#### **Measuring quality of patient plan of care discussions**

An objective assessment of the care plan of ICU patients, with multiple conditions, can help identify important information that otherwise may not be noticed, such as inadequacies in the standard of care, need for patient discharge planning or exploration of patient care alternatives (see Table1).<sup>7,12,13</sup>

In one report we videotaped and analyzed 60 IDRs, including 495 patient discussions in two hospitals in 5, closed-format, units for adult patients. We showed that the ICU staff, of ICUs which were located in the university medical centre and which organised daily IDRs, had a surprisingly lower 'yes' rating on the quality indicators 'the main problem discussed,' '(potential) goal formulated,' and 'long term interventions discussed'. The quality indicators 'secondary problems discussed' and 'short-term interventions discussed' revealed higher 'yes' scores.<sup>15</sup> This may indicate, that the patients' main problem is not clear to or hasn't been shared with all ICU team members. Such findings can be helpful to a program designed to improve team cooperation and shared understanding of treatment and care goals.

Clearly, the list of 8 quality indicators within the domain patient plan of care of our IDR Assessment Scale has the benefit of being simple, is derived from daily practice, and is easily applicable for real time rating.

#### **Measuring quality of Team Process**

In regard to the team process, studies within the acute medical setting found that open communication, and in particular where listening to trainees and nurses was concerned, was not only associated with a decrease in adverse events, but it also improved the atmosphere and motivated nurses to stay in that environment.<sup>15-17</sup> The communication was analysed by seeking and valuating contributions from ICU team

members. A less open and less professional culture may lead to conflicts or needless irritation between ICU medical and nursing staff with perceived differences regarding responsibilities, status and authority.<sup>1</sup>

The domain 'Process' of our IDR Assessment Scale is an objective tool to observe the interdisciplinary approach, it assesses the transfer of information and coordination and includes indicators about teaching obligations (see Table 1).<sup>12</sup>

Our results of videotaped and analyzed IDRs in two hospitals showed that the ICU staff from the centre which organised *daily* IDRs had a higher 'yes' rating on the quality indicators which reflected the input of the ICU nurse, such as 'are there questions for nurse'.<sup>7,8</sup> The quality indicator 'summary given' was rated low. Both hospitals had a high 'yes' rating on the indicator about the consultant specialists and low 'yes' ratings on indicators about junior physicians reflecting teaching obligations. The indicator 'it is clear who is responsible for performing tasks' was also rated low in both hospitals. Upon asking, leading intensivists confirmed this low score on coordination and recognised that appointments made during IDRs frequently needed confirmation or extra explanation to junior physicians and ICU nurses because of different interpretations. This phenomenon could be an explanation for or may contribute to miscommunication among ICU team members.

### **Measuring mutual agreement about patient plan of care**

To crosscheck the results of the analyzed patient discussions with (parts of) the IDR Assessment Scale, instead of measuring patient outcomes, a 14-item survey was developed. The survey was adapted from Pronovost's "daily goal sheet" and aimed at measuring how information about the patient care plan, among the different disciplines, is *interpreted* apart from whether or not it is rated.<sup>13</sup> The survey was obtained directly after daily IDRs.

Results of 90 filled out surveys about 30 ICU patients demonstrated that the range of mutual agreement with patient care between the intensivists, junior physicians, and ICU nurses was low after IDRs. Before our survey, most ICU care professionals considered their IDRs to be performed adequately. Clearly, our observations suggest otherwise. We found a discrepancy between ICU nurses and junior physicians regarding perceptions of patient's conditions and the plan of care. Overall, intensivists and ICU nurses tended to agree more with each other.



## 2) MAKING INTERVENTIONS AIMING TO IMPROVE PERFORMANCE

### Training program Leading Skills for ICU fellows

From the perspectives of both patient plan of care and team process, strong leadership includes focusing on goals to improve the ability of team members to work in a coordinated and collaborative manner. Strong leadership skills also concern a clear understanding of joint responsibilities, along with continuous active cross checking, to prevent key activities from escaping attention. All these aspects of leadership contribute significantly to a good patient outcome, such as reduced length of stay.<sup>9,14,18</sup>

Considerations to develop a leadership training to improve performance were the low ratings on quality indicators of the IDR Assessment Scale in 2 ICUs. Secondly a training program for ICU fellows corresponds to the hierarchical structure of most ICU teams. Third, training fellows and future intensivists is a less costly intervention to influence team behavior than training the entire current ICU medical and nursing staff. Finally, we also think that leadership behavior is an observable, learnable competency, rather than a trait.<sup>16,19</sup>

We conducted a non-randomized intervention study in 4 units in our university medical centre. An intensive 1-day training session was given in a simulated environment with workplace-based feedback sessions. All participants were fellow intensivists who had no formal training in leading IDRs. The 10 *essential*/quality indicators of the IDR Assessment Scale were used to assess and train leadership skills.<sup>7,8</sup> During the training program, all participants improved their leadership skills. More interesting however is whether or not this improvement retains in daily practice.

**Table 1.** Performance Improvements: The IDR\* Assessment Scale including the Patient Plan of Care and Process domain and the essential indicators to Guide and train Leadership Skills.

		IDR Assessment Scale	Checklist Leading IDR
		Containing	Containing
	<b>DOMAIN: PATIENT PLAN OF CARE</b>		
1.	<b>Main problem discussed</b>	X	X
2.	<b>Diagnostic plan discussed</b>	X	X
3.	<b>The (provisional) goal formulated</b>	X	X
4.	<b>Long-term interventions (<math>\geq 16</math> h) discussed</b>	X	X
5.	<b>Patient greatest risk discussed</b>	X	X
6.	Secondary problems discussed	X	
7.	Plan of care for secondary problems discussed	X	
8.	Short-term (< 16 h) interventions discussed	X	
	<b>DOMAIN: PROCESS</b>		
9.	<b>Expectations made clear by consultants</b>	X	X
10.	<b>Input of junior physicians encouraged</b>	X	X
11.	Are there questions for junior physicians?	X	
12.	Junior physician asks for advice/information	X	
13.	Leader checks whether junior physician knows what to do according to patient plan of care	X	
14.	<b>Input of nurses encouraged</b>	X	X
15.	Are there questions for nurse?	X	
16.	ICU nurse acts proactively and assertively about patient plan of care	X	
17.	Leader checks whether the nurse knows what to do according to patient plan of care	X	
18.	<b>Summary given</b>	X	X
19.	<b>It is clear who is responsible for performing tasks</b>	X	X

\* IDR, InterDisciplinary Round. Essential indicators are noted in bold text.

### 3) REMEASURING THE INDICES TO DOCUMENT EFFECTS

#### Post-test of the Quality of the Performed IDRs

The 10 *essential*/quality indicators of the IDR Assessment Scale were used to re-measure the efficacy of the intervention.<sup>7,8</sup> Re-measurement included 9 videotaped and analyzed IDRs, (total 99 patient discussions) lead by the (fellow) intensivists who received the intervention (leadership) training.

Results of 99 patient discussions after the leadership skills training, guided and measured using the 10 essential quality indicators, showed that this intervention was able to improve quality of performed IDRs in the ICUs. Furthermore, the sustained effect of the intervention, as measured at 6 weeks after the training, suggested that the training was still effective after 6 weeks and useful in daily practice.<sup>8</sup>

### DISCUSSION

It appears to be difficult to reflect on ones own performances in daily IDRs. The attention of clinicians is claimed by medical choices in diagnostics and therapeutic strategies; however, other aspects such as focus on short and long term goals in care, and coordination of activities should also be well run. Attention to the communication process is easily confused with friendliness, as opposed to ensuring that the choices that have been made are applied appropriately and uniformly.

A starting point for well performed IDRs and strong leading skills is the focus on goals. Goals refer to both clinical outcomes and important measurable processes concerned with the delivery of high quality care, and are especially important in interdisciplinary, as opposed to uni-disciplinary rounds.<sup>14,20</sup> From the perspective of the team process, a focus on goals improved the ability of team members to work in a coordinated and collaborative manner.<sup>18,21</sup> An unifying purpose is helpful in removing the traditional hierarchical barriers between nurses and physicians, because the focus is less on individual achievement and more on common effort and goals. Research in intensive care found that the degree to which individuals reported to understand patient care goals depends on perceived communication and openness among team members.<sup>22,23</sup> Although the importance of shared goals is reported in several studies about teamwork, and collaboration is associated with improved outcome, it is an underestimated aspect of daily ICU care.<sup>22,23</sup> From that point of view, improving ICU performance by targeting interdisciplinary communication, seems to require a shift of

paradigm. It is relevant to evaluate the quality of IDRs on a regular basis with a quantitative instrument in order to guide and establish this process.

Regarding staff satisfaction, medical specialists appear often to be more satisfied with communication than nurses.<sup>24</sup> Although the ICU nurses' knowledge and skills have made great strides in recent years, this had apparently little or no effect on cooperation and sharing ideas about goals and care for individual patients. Consequently, ICU nurses feel that their knowledge and skills are underappreciated.<sup>25,26</sup>

Regarding patient and family satisfaction, the different ways in which the leading intensivists lead the IDRs can generate confusion among the junior physicians and ICU nurses regarding the patient care plan. As a consequence, they may communicate different or unjustified information to patients and family members unnecessarily contributing to a state of confusion or anxiety. We feel that strong leadership skills by intensivists and cross checking mutual agreement on important aspects of patient care (during IDRs), before communication with family or patients takes place, will improve patient- and family satisfaction.

Finally, a problem inherent to videotaping IDRs is the awareness of being videotaped and this may affect the discourse in the IDR that is being evaluated. Participants need to be strictly informed about the purpose of this rating and that their videotaped IDRs are not used for illustration of any behavior. Although the leading intensivists declared to forgetting that they were being videotaped after just one patient presentation, we are not sure if this can be generalized for the individual junior physician or ICU nurse.

## CONCLUSION

Assessment of the quality of performed IDRs gives insight into the main ICU processes, such as the continuity of care, information transfer, teaching obligations and whether or not the communication and planning within the team was effective. This review discusses the observation and intervention applications of performance improvements for IDRs. Depending on the characteristics of the ICU, such as staffing level and open versus closed unit type, work rounds being IDRs in crowded hallways, or teaching obligations, ICU staff has some options when choosing which instrument(s) to apply.

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## SUMMARY AND FUTURE PERSPECTIVES

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This thesis investigates the interdisciplinary communication about the patients' plan of care during interdisciplinary rounds (IDRs) in the intensive care unit (ICU). A well performed IDR is considered to be a patient-focused communication system where the appropriate plan of care is agreed on, understood, and executed as planned by specialists from different disciplines. IDRs are increasingly recommended as a result of two main developments in health care, namely, the development of interdisciplinary teams to provide patient-centered care, in contrast with traditional discipline-centered care, and the knowledge that ineffective interdisciplinary communication among medical teams is a leading cause of preventable patient harm and a source of severe conflicts.

The studies within this thesis investigate several aspects of IDRs in the ICU: 1) the key characteristics of well performed IDRs as derived from literature reviews, 2) assessing the quality of IDRs by development of an assessment scale, 3) the effect of leadership training on the quality of performed IDRs, 4) the perceptions of the care providers after IDRs on important aspects of the patients' plan of care, and 5) the assessment of long-term patient discussions during rounds.

**Chapter 1** provides a brief introduction about the situation, as revealed by previous studies, which shows unclear structures and various ways in which IDRs are organized. IDRs are often more provider-centered than patient-centered. This chapter also presents the process and results of a narrative literature search which was performed due to heterogeneity in study methods, the use of ill defined concepts and diversity in outcomes of interest. The following questions were answered by this review. First, what outcomes are revealed in studies reporting interdisciplinary communication in the intensive care unit? Second, what outcomes are, empirically tested, "improved outcomes"? And third, which aspects of interdisciplinary communication are associated with these improved outcomes? The results of this literature search reinforce the belief that: 1) the use of daily patient goals together with, 2) open communication to understand these patient goals, 3) strong leadership behavior, and 4) the use of checklists comprise the key characteristics of well-performed IDRs in the ICU because these are associated with improved outcomes for the ICU patient and/or the ICU care providers. These results functioned as a foundation for development of the IDR Assessment Scale.

**Chapter 2** describes the development, statistical tests, and application of an assessment instrument with essential and supportive quality indicators to measure the

quality of performed IDRs in ICUs. The tool development was established in consecutive steps: 1) criteria for assessments instruments, 2) Delphi Rounds, which analyze videotaped IDRs and combined the findings with a previous literature search, 3) application of the instrument on adults in 3 ICUs, in 2 hospitals, resulting in 22 videotaped IDRs, and 4) data and statistical analysis. The IDR-Assessment Scale consists of 19 quality indicators subdivided in 2 domains namely “patient plan of care” with 8 quality indicators and “process” with 11 quality indicators. The domain “patient plan of care” reflects the technical performance from the initial identification of a goal to the evaluative phase, such as “main problem discussed”, “provisional goal formulated” and “long-term therapeutic items (> 16 h) discussed.” The domain “process” reflects the team processes which ensure the appropriate plan of care is agreed on, understood, and executed as planned by all care providers, for example, “it is clear who is responsible for performing tasks”, “summary given” and “input of nurses encouraged”. Indicators are both essential and supportive.

All 3 ICUs that were rated in this study considered their IDRs to be adequately performed and they were surprised by our assessment results. For example, higher scores were revealed in 2 ICUs on secondary problems (supportive indicator), short-term interventions (supportive indicator), and encouraging input of nurses (essential indicator). At the same time, the essential indicators such as “main problem,” “formulating patient goals,” “long-term interventions,” and “It is clear who is responsible for performing tasks,” were discussed less.

**Chapter 3** reports the importance of leadership skills to guide interdisciplinary patient-centered care in intensive care medicine. The most common method for physicians to acquire leadership skills is by role modeling senior physicians or colleagues. Because this role modeling method is considered to be a rather ineffective way to obtain skills, we tested its usability and reliability using the 10 essential quality indicators of the IDR-Assessment Scale as a checklist. We applied this checklist to 9 interdisciplinary rounds with 99 discussions about the patients’ plan of care in the intensive care unit, lead by 9 experienced intensivists, and we collected the scores. We computed and analyzed descriptive statistics of these 99 patient presentations for differences in ratings per quality indicator and per intensivist.

**Chapter 4** reports the importance of leadership behaviour of the intensivists during IDRs in the ICUs where an interdisciplinary team communicates and makes

decisions about the patients' plans of care. Recent studies have shown that leadership behaviour can be trained to improve subsequent team performance during resuscitation, so a non-randomized intervention study was conducted using the IDR-Assessment Scale to critically assess the effect of a leadership training course on the quality of IDRs. Study participants included intensive care medicine-fellows and a control group of experienced though untrained intensivists. The intervention group participated in leadership training, which was performed in a simulated environment. This training was consistent with the principles of adult learning and behavioral modeling. The IDRs led by participants of both the intervention and control groups were videotaped and the quality of the IDR was measured in reference to the 10 essential quality indicators of the IDR-Assessment Scale.

Baseline measurements of the control and intervention groups revealed 2 indicators that differed significantly. The frequency of yes ratings for the intervention group significantly increased for 7 of the 10 indicators from before to after the intervention. The frequency of yes ratings after training was significantly greater in the intervention group than in the control groups for 8 of the 10 essential quality indicators.

**Chapter 5** reports the mutual agreement between intensivists, junior physicians, and ICU nurses after IDRs. IDRs are time-consuming and insights into the perceptions and mutual agreements between the ICU care providers regarding patient care are limited. In situations where IDRs take place in the ICUs, reaching an agreement is important because IDRs are complicated due to differing perceptions, educational backgrounds, and beliefs regarding the responsibility of team members and consultants.

So far, studies on interdisciplinary communication during IDRs have predominantly investigated overall satisfaction of communication, the decision-making process, and the use of checklists. We therefore performed a single-centre survey among intensivists, junior physicians, and ICU nurses to test the range of agreement regarding patient care after IDRs. This survey was created by adapting a checklist from Pronovost's "Daily Goals Form" for three reasons: 1) its items specify goals, potential risks, and variables that ICU care providers focus on, 2) the study was (modified) retested, and 3) it contained components identified in other checklists.

To determine the range of agreement among intensivists, junior physicians, and nurses regarding the same ICU patient, 90 completed surveys by all three groups about

30 ICU patients were analyzed (i.e. 3 observations per patient). The survey revealed significant differences between the hypothesized agreements of 90% and the saturated agreement with 12 of 14 questions.

**Chapter 6** reports how long-term patients who stayed more than 10 days in the thoracic ICU were discussed during IDRs. We therefore tested the reliability and usability of a checklist which consisted of the 8 quality indicators of the first domain (patient plan of care) of the IDR-Assessment Scale. Discussions of the long-term patients were compared with those of short-term patients. There was a significantly lower frequency of yes ratings for the long-term than the for the short-term patients for 2 quality indicators (main problem discussed and [provisional] goal formulated). There was a significantly higher frequency of yes ratings for long-term patients than for short-term patients for 1 quality indicator (plan of care for secondary problems discussed). This study reveals that ICU care professionals who do not clearly address important aspects of the plan of care of the long term patients may hamper improvement of the quality of patient care and resource use.

**Chapter 7** reports the application of interdisciplinary rounds, the problems and potentials, as a strategy to increase quality of care in the intensive care unit. Meaningful and sustained improvement of the quality of care requires a systems-oriented approach via a persistent process of studying and changing the ICU structures and processes. This chapter describes this process by explaining the following steps: 1) measuring relevant indices of ICU performance, 2) making interventions aimed at improving performance, and 3) re-measuring the indices to document the effect of the intervention.

**Chapter 8** contains the summary of our findings. The chapter ends with suggestions for future research. Namely, replicating our studies in other ICU settings may be required to further evolve and validate the general usefulness of the IDR-Assessment Scale, the leadership training aimed at leading IDRs, the survey about mutual agreement, and the checklist to discuss the long-term patient.

## MAIN FINDINGS

Within this thesis, we explored empirical studies in ICUs which resulted in the following main findings:

- The quality of performed IDRs can be reliably assessed for patient plan of care and process with the IDR Assessment Scale.
- For well performed IDRs, all essential quality indicators of the IDR Assessment Scale need to be rated with 'yes' or 'not applicable'.
- The checklist with 10 essential quality indicators is a reliable checklist to evaluate leading IDRs.
- The leadership training improves the quality of IDRs performed in the ICUs.
- Our survey about testing mutual agreement about patient plan of care directly after IDRs, demonstrated low agreement between intensivists, junior physicians and ICU nurses.
- The patient plan of care domain of the IDR Assessment Scale is usable and reliable in the discussion of the long-term ICU patient during IDRs. This may provide useful feedback to promote timely adjustments of treatment plans.
- Assessment of the quality of performed IDRs may provide insight into ICU processes, such as the continuity of care, information transfer, teaching obligation and whether or not the communication and planning within the team was effective.

## **FUTURE PERSPECTIVES**

Our IDR Assessment Scale seems to be an effective measurement tool. It is derived from daily practice and it is easily applicable. However, it should be mentioned, as with other outcomes scales, there is a trade-off between providing a full description of the situation and making the scale simple enough for practical use.

The studies presented in this thesis describe the performance of IDRs in 5-closed format- ICUs with high-intensity intensivist staffing, with day and night time coverage, in two hospitals in the northern part of the Netherlands. It remains to be determined whether our results can be replicated in other ICUs, in ICUs with low intensity physician staffing or can be extended to e.g. pediatric and neonatal ICUs. We hope that our tool and indicators may evolve with further study to support ICU management by providing feedback for their quality improvement programs regarding communication and cooperation. We are awaiting the results of such studies. Furthermore, we are curious about practical application of our tool and indicators. Most importantly, how it contributes to patient clinical outcome as well as patient, family, and staff satisfaction.

Despite the underlined importance of strong leadership behaviour by physicians in daily care, in the curricula of most medical schools there is limited focus on leadership training programs. Further data are needed to show the beneficial effects of such a training program on future physicians' performance in ICU rounds as well as in meetings in other departments like general wards and emergency departments.

From a practical point of view, it is helpful to investigate whether simply giving feedback on indicators of leading behaviour during rounds generates equally positive results as participating in a specific training course. On the other hand, further study is needed to investigate whether following a training course is more effective in teaching fellow intensivists to lead IDRs than the more traditional role modelling method.

Leadership behaviour may be affected by sex and personality. During resuscitation tests, female students show less leadership behaviour and have less hands-on time than male students. Male providers show less leadership skills in tasks with complex social interactions, which may require more relationship-oriented leadership behaviour that is in accordance with sex stereotypes. The effects of a more relationship-oriented leadership style on leading IDRs needs further study.

ICU care professionals, nurses and physicians, are dedicated to their patients, patients' family and colleagues. To maintain and possibly improve quality, a regular check-up and evaluation of staff performance by a reliable quantitative instrument is needed. The identification of some important or relevant issues are not immediately obvious to each or not easily detected by self-reflection of the participating ICU staff. We hope that future studies will show that frequently assessing the quality of IDR contributes to the patients', the patient's family's and the staff's wellbeing.



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## NEDERLANDSE SAMENVATTING

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De hoofdstukken in dit proefschrift beschrijven verscheidene facetten van het multidisciplinair overleg (MDO) op de intensive care afdeling (IC). Onder een goed uitgevoerd MDO wordt verstaan: een overlegstructuur waarbij het juiste behandelplan van de patiënt wordt vastgesteld, dat door iedere IC professional wordt begrepen en volgens een afgesproken plan wordt uitgevoerd.

Het organiseren van een MDO wordt door meerdere instanties sterk aanbevolen vanwege:

- 1) de implementatie van multidisciplinaire teams om patiëntgerichte zorg te bieden, in tegenstelling tot de van oudsher meer traditionele disciplinegerichte zorg,
- 2) het faciliteren van een efficiënte samenwerking en communicatie binnen medische teams.

Een inefficiënte samenwerking en communicatie tussen de verschillende zorgverleners wordt gezien als een belangrijke oorzaak van *vermijdbare* schade aan de patiënt en een potentiële bron van conflicten binnen een IC team. Tegelijkertijd ontbreekt het aan instrumenten hoe dit MDO op de juiste manier te effectueren.

Vanuit deze achtergrond behandelen we achtereenvolgens de volgende onderwerpen:

1. de ontwikkeling van een instrument die de kwaliteit van een multidisciplinaire patiëntenbespreking qua behandelplan en proces kan beoordelen;
2. de ontwikkeling van een checklist om het leidinggeven aan een MDO te ondersteunen;
3. het effect van een training van de voorzitters op de kwaliteit van de uitgevoerde MDO's;
4. een vragenlijst over de perceptie en gezamenlijke overeenstemming van zorgverleners na een MDO op kritische aspecten van het behandelplan van de patiënt;
5. het evalueren van een checklist aangaande de IC-patiënt met een IC-verblijfsduur van langer dan 10 dagen.

**Hoofdstuk 1** beschrijft, na een algemene introductie, het proces en de resultaten van een literatuuronderzoek. Voor deze studieopzet is gekozen vanwege de heterogeniteit in onderzoeksmethodieken, het gebruik van container begrippen en de diversiteit van studie resultaten. De uitkomsten van dit literatuuronderzoek versterken de overtuiging

dat 1) het gebruik van patiëntgerelateerde behandel doelen samen met 2) een open communicatie opdat deze behandel doelen door iedere professional worden begrepen, 3) sterk leiderschapsgedrag en 4) het gebruik van checklists, de belangrijkste kenmerken zijn van goed uitgevoerde MDO's op de IC. Deze kenmerken zijn tevens geassocieerd met verbeterde uitkomsten voor zowel de IC patiënt als de IC zorgverleners. Doel van dit proefschrift is om de verschillende aspecten van een MDO te onderzoeken, zoals onder andere het ontwikkelen van een meetinstrument en een interventie om de kwaliteit van het MDO te beoordelen en te verbeteren.

**Hoofdstuk 2** beschrijft de ontwikkeling, de statistische onderbouwing en toepassing van een beoordelingsinstrument met essentiële en ondersteunende kwaliteitsindicatoren om de kwaliteit van het MDO in IC's te beoordelen. Dit beoordelingsinstrument werd ontwikkeld aan de hand van de volgende stappen, namelijk

1. Literatuuronderzoek naar criteria voor beoordelingsinstrumenten;
2. Delphi rondes die gefilmde MDO's analyseerden. Deze bevindingen werden gecombineerd met eerder uitgevoerd literatuuronderzoek ( zie hoofdstuk 1);
3. Toepassing van het instrument op 3 IC's voor volwassen patiënten in 2 ziekenhuizen gedurende 22 gefilmde MDO's welke werden geleid door 14 intensivisten, terwijl de behandelplannen van 98 patiënten werden besproken;
4. Data en statistische analyses.

De MDO- Beoordelings Schaal bestaat uit 19 kwaliteitsindicatoren onderverdeeld in 2 domeinen, namelijk "Patiënt behandelplan" met 8 kwaliteitsindicatoren en "Proces" met 11 kwaliteitsindicatoren. Het domein "Patiënt behandelplan" weerspiegelt het systematisch medisch handelen van diagnose, naar beoogde doelen tot en met de evaluatie. Indicatoren zijn bijvoorbeeld: "het hoofd probleem besproken", "(voorlopige) doelstelling geformuleerd " en "lange termijn therapeutische interventies (> 16 uur) besproken ". Het domein "Proces" weerspiegelt de teamprocessen die van belang zijn opdat het juiste behandelplan is vastgesteld, door ieder begrepen en volgens plan uitgevoerd zal worden door de zorgverleners. Indicatoren in dit domein zijn bijvoorbeeld: "het is duidelijk wie verantwoordelijk is voor het uitvoeren van taken", "samenvatting is gegeven "en" inbreng van de verpleegkundigen wordt gestimuleerd". Indicatoren zijn essentieel of ondersteunend.

De medische staf en de IC verpleegkundigen op deze 3 ICs waren van mening dat zij hun MDO's adequaat hadden ingericht en uitgevoerd, en zij waren verrast door onze evaluatieresultaten. Zo werden hogere scores gezien in 2 ICs op bijkomende problemen, kortdurende interventies en het stimuleren van inbreng van verpleegkundigen. Tegelijkertijd werden het hoofdprobleem, het formuleren van de behandeldoelen en lange termijn interventies, minder besproken. Alle 3 de IC's scoorden lager op: het is duidelijk wie verantwoordelijk is voor het uitvoeren van taken. Dit was niet verrassend voor de intensivisten. Ze hadden ook de ervaring dat afspraken, gemaakt tijdens het MDO, vaak nog een bevestiging of extra uitleg nodig hadden voor de arts-assistenten en/of IC verpleegkundige als gevolg van verschillende interpretaties. Doorgaans planden zij daarom een afdelingsronde direct na het MDO.

**Hoofdstuk 3** beschrijft het gebruik van een checklist die bestaat uit de 10 essentiële kwaliteitsindicatoren van het MDO- beoordelingsschaap. Deze lijst is samengesteld om (fellow) intensivisten een leidraad te bieden bij het voorzitten van een MDO. Doorgaans leert men deze vaardigheden door role-modeling van senior specialisten c.q. collegae. Echter dit kan een minder effectieve methode zijn.

Hiervoor filmde we 18 MDO's met 198 patiëntenbesprekingen, geleid door 10 ervaren intensivisten en 9 fellow intensivisten. We verzamelden de scores met de MDO Beoordelings Schaal. We berekenden en analyseerden deze patiëntenbesprekingen per kwaliteitsindicator en per intensivist. De resultaten van deze studie laten zien dat de scores op de kwaliteitsindicatoren een grote mate van diversiteit laat zien.

**Hoofdstuk 4** beschrijft een niet gerandomiseerd interventieonderzoek naar training "leiding geven aan het MDO". Het belang van goed leiderschap van de intensivisten ten behoeve van een goed uitgevoerd MDO op de IC wordt veelvuldig aangegeven in diverse studies, mede omdat deze goed aansluit bij de hiërarchische cultuur op veel IC's. Omdat recente studies aantonen dat dit leiderschap gedrag kan worden getraind, hebben we het effect van een leiderschapstraining op de kwaliteit van het MDO op de IC gemeten met de MDO-Beoordelings Schaal. Deelnemers aan deze studie waren fellows in de interventiegroep en een controlegroep van ervaren, edoch in dit opzicht niet getrainde, intensivisten.

De opzet van de training was conform de principes van de volwasseneneducatie. MDO's die geleid werden door de deelnemers van zowel de interventie- als de controlegroep, werden gefilmd. De kwaliteit van het MDO werd

gemeten met de MDO-Beoordelings Schaal en aansluitend nabesproken. De interventie bestond uit een deelname aan een leiderschapstraining (1 dag) in een simulatieomgeving.

De leiderschapstraining verbeterde de kwaliteit van 99 patiëntenbesprekingen welke geleid werden door de deelnemers van de interventiegroep in vergelijking met 99 patiëntenbesprekingen van de controlegroep. Er was een verbetering binnen beide domeinen van het "Patiënt behandelplan" en "Proces". Significante verbetering werd gezien in 12 van de 19 kwaliteitsindicatoren en significante daling werd genoteerd in 1 kwaliteitsindicator, te weten "bijkomende problemen besproken".

**Hoofdstuk 5** beschrijft de uitkomsten van een vragenlijst aangaande de perceptie en gezamenlijke overeenstemming tussen intensivisten, arts assistenten en IC verpleegkundigen na het MDO over kritische onderdelen van het patiëntbehandelplan. Immers, MDO's zijn tijdrovend en inzichten vanuit eerdere studies naar de percepties en gezamenlijke overeenstemming tussen de IC zorgverleners ten aanzien van het patiëntbehandelplan zijn beperkt. Tot nu toe hebben studies het fenomeen multidisciplinaire communicatie (tijdens een MDO) voornamelijk onderzocht op algemene tevredenheid over de communicatie, de besluitvorming, en het gebruik van checklists in een MDO. Hierbij werd aangegeven dat de uitvoering gecompliceerd wordt door een diversiteit aan perceptie, opleidingsachtergrond, en verschillende verantwoordelijkheden van de individuele teamleden en consultants.

Onze vragenlijst was gebaseerd op de checklist van Pronovost's "Daily Goals Form". Om de mate van gezamenlijke overeenstemming tussen intensivisten, arts assistenten en verpleegkundigen aangaande het patiëntbehandelplan vast te stellen werden 90 ingevulde vragenlijsten, die door alle drie de groepen waren ingevuld over 30 IC-patiënten geanalyseerd (dat wil zeggen 3 waarnemingen per patiënt). Resultaten toonden significante verschillen bij 12 van de 14 vragen tussen enerzijds de *hypothetische* gezamenlijke overeenstemming van 90% en anderzijds de *gemeten* gezamenlijke overeenstemming.

**Hoofdstuk 6** evalueert de bespreking van de patiënt met een gemiddelde verblijfsduur van 24,9 dagen aan de hand van het domein "behandelplan van de patiënt" met 8 kwaliteitsindicatoren afkomstig uit het MDO-Beoordelings Schaal. Deze bevindingen werden vergeleken met de bespreking van de patiënt met een gemiddelde verblijfsduur van 2,5 dagen).

Resultaten laten zien dat er, opmerkelijk genoeg, weinig verschil is tussen de bespreking van patiënten met een korte en lange verblijfsduur.

**Hoofdstuk 7** beschrijft de implementatie van MDO's, de mogelijkheden en knelpunten, om als strategie te fungeren ter verbetering van de kwaliteit van IC zorg. Een zinvolle en blijvende verbetering van kwaliteit van zorg vraagt een systeem-georiënteerde benadering die gedurende een langere tijd wordt ingezet om zowel het proces als structuur van de IC te beïnvloeden. Dit hoofdstuk beschrijft hoe dit proces ten aanzien van MDO's kan worden geëffectueerd, namelijk door: 1) het meten van relevante indicatoren van de eigen IC afdeling, 2) het inzetten van interventies om onderdelen van de IC afdeling (inclusief structuur en proces) te verbeteren, en 3) nameting van de relevante indicatoren om het effect van de interventies te meten.

**Hoofdstuk 8** beschrijft de samenvatting van het gehele proefschrift. Het hoofdstuk eindigt met suggesties voor toekomstig onderzoek. Replicatie is nodig ten behoeve van het verder ontwikkelen en valideren van 1) de MDO-Beoordelings Schaal; 2) de leiderschapstraining gericht op goed leiding geven aan een MDO; en 3) de vragenlijsten over de gezamenlijke overeenstemming na een MDO tussen de verschillende zorgverleners over kritische aspecten van het patiënt behandelplan.

## CONCLUSIES

1. De MDO-Beoordelings Schaal bestaande uit de domeinen 'Behandelplan' en 'Proces' meet de kwaliteit van het MDO op de IC;
2. De 10 essentiële kwaliteitsindicatoren van de MDO-Beoordelings Schaal kunnen als checklist fungeren ten behoeve van het leiden van een MDO op de IC;
3. De competentie 'Leiding geven aan een MDO op de IC' kan door middel van een training worden verworven;
4. De vragenlijst is geschikt voor het meten van de perceptie en het vaststellen van overstemming tussen intensivisten, arts assistenten en IC-verpleegkundigen na een MDO op de IC over kritische aspecten aangaande het behandelplan van de patiënt;
5. Het meten van de kwaliteit van het MDO kan inzicht verschaffen in de belangrijke processen op de IC, zoals continuïteit van zorg, informatie overdracht, opleidingsmogelijkheden en of de communicatie en coördinatie binnen het team effectief verloopt.

**BLIK OP DE TOEKOMST**

Onze MDO- Beoordelings Schaal lijkt een effectief meetinstrument te zijn. Het is afgeleid van de dagelijkse praktijk en het is gemakkelijk toe te passen. Bij het ontwikkelen van deze beoordelingsschaal is er de afweging geweest tussen enerzijds een volledige weergave van alle aspecten van een multidisciplinaire overlegsituatie en anderzijds, een zo eenvoudig mogelijke instrument voor praktische toepassing.

De studies in dit proefschrift beschrijven het onderzoek naar en verbetering van de kwaliteit van uitvoering van MDO's op 5 IC's geleid door intensivisten in 2 ziekenhuizen in het noorden van Nederland. Verder onderzoek moet worden uitgevoerd naar de generaliseerbaarheid van de instrumenten naar IC's waar bijvoorbeeld nauwelijks intensivisten werken, of naar kinder- en neonatale IC's. Onze beoordelingsschaal, interventie en vragenlijst zullen wellicht door volgende studies verder ontwikkeld worden, opdat IC management van gedegen feedback wordt voorzien en hierop kan sturen. Deze feedback is belangrijk om adequate verbetermaatregelen te kunnen funderen. Vervolgstudies zijn ook belangrijk om interventies ter verbetering van de kwaliteit van het MDO te relateren aan patiëntenuitkomsten en/of staf- en familie tevredenheid.

Ondanks dat het belang van goed leiderschap in meerdere internationale studies wordt benadrukt, is het een klein onderdeel van curricula in medische vervolgopleidingen. Verdere studies zijn nodig om te verifiëren of het expliciet trainen van leidinggeven aan het MDO, leidt tot verbetering van de performance van artsen tijdens MDO's in andere overlegsituaties met algemene en spoedeisende afdelingen. Vanuit praktisch oogpunt gezien is het nuttig om te onderzoeken of het geven van feedback aan leidende intensivisten aan de hand van de checklist, dezelfde positieve resultaten genereert als een training. Nader onderzoek is nodig om te meten of de 'role-modeling' methode voor fellow-intensivisten net zo effectief is als de training leiding geven aan een MDO.

Leiderschapsgedrag kan beïnvloed worden door geslacht en persoonlijkheidskenmerken. Onderzoek naar leiderschapsgedrag tijdens reanimatietraining laat zien dat vrouwelijke studenten minder leiderschapsgedrag en minder "hands-on" gedrag laten zien dan hun mannelijke studenten. Daarentegen laten mannelijke studenten minder leiderschapsgedrag zien als het



gaat om leiding geven aan complexe sociale interacties. Het effect van een meer relatiegeoriënteerd leiderschapsgedrag op het leiden van MDO's behoeft nadere studie.

IC zorgverleners, artsen en verpleegkundigen zijn zeer betrokken bij hun patiënten, de familie van patiënten en collega's. Om kwaliteit van zorg te handhaven en te verbeteren is het belangrijk om op regelmatige basis een *evaluatie* van het MDO te realiseren door middel van een meetinstrument. Immers, de identificatie van sommige belangrijke onderdelen zijn niet direct zichtbaar door zelfreflectie van participerende IC staf. We hopen dat toekomstig onderzoek laat zien dat regelmatige evaluatie van de kwaliteit van het MDO bijdraagt aan optimalisering van patiëntenzorg, zorg aan families en het welbevinden van de staf.

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## DANKWOORD

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Nadenkend over wie ik allemaal zou willen bedanken die een bijdrage hebben geleverd aan het tot stand komen van dit proefschrift, realiseerde ik mij dat het idee voor het schrijven van een proefschrift circa 5,5 jaar geleden is ontstaan. In diezelfde jaren ontwikkel je veel ideeën, heb je veel en verschillende collega's, en worden de ideeën met evenzo veel collega's en familieleden besproken. Ik realiseer me dan ook terdege dat ik nooit en te nimmer alle collega's, die in meer of mindere mate een aandeel in het tot stand komen van dit proefschrift hebben gehad, zou kunnen bedanken zonder een aantal te vergeten. In dit dankwoord wil ik mij dan ook beperken tot die mensen die in de laatste paar jaren waarin dit proefschrift geschreven is, mee hebben gedacht en geschreven.

In de eerste plaats wil ik Prof. dr. J.E. Tulleken, dr. R.E. Nap en drs. H.E.P. Bosveld bedanken die de afgelopen vijf jaren samen hard met mij hebben gewerkt aan de ontwikkeling, publicaties en afronding van de verschillende deelstudies van dit proefschrift.

Promotor Prof. dr. J.E. Tulleken, beste Jaap, dank je wel voor je enthousiasme voor juist dit 'zachte' onderwerp en jouw bereidheid om mijn promotor te zijn. In al onze gesprekken, in al je inzet met het denken over checklists en het corrigeren van de manuscripten, ben je enthousiast geweest.

Copromotor dr. R.E. Nap, beste Raoul. Onze gezamenlijke belangstelling voor Intensive Care en communicatie, jij vanuit de EURICUS studies en ik als coördinator IC opleiding en communicatie trainer, bleek een vruchtbare bodem voor het tot stand komen van dit proefschrift. Je hebt me gedurende de afgelopen jaren met raad en daad, te pas en te onpas, bijgestaan gedurende dit hele traject. Veel dank hiervoor.

Drs. H.E.P. Bosveld, beste Henk, het kostte me aanvankelijk moeite om een statisticus te vinden die bereid was om te participeren in psychometrisch onderzoek. Gelukkig zag jij daar de uitdaging van in en hebt bij de deelstudies de statistiek op de voor jou kenmerkende bescheiden en consciëntieuze wijze onder je hoede genomen. Daarbij was je altijd bereid om op willekeurige momenten, nogmaals de statistische berekeningen te checken. Hartelijk dank hiervoor.

Een speciaal woord van dank is voor mijn zwager Robert C. Wagenaar, voormalig hoogleraar aan de Boston University en Universiteit van Utrecht. Robert, ik zal niet vergeten hoe jij, tijdens onze gezamenlijke vakantie in Toscane in 2011, geduldig en vol optimisme, mijn onderzoeksdesign herstructureerde met een zeer

positief resultaat. Je overleed onverwachts in februari 2013. Je had graag zitting genomen in de corona en het is verdrietig dat we dit feestelijke moment niet meer in gezamenlijkheid kunnen vieren.

De leden van de beoordelingscommissies, Prof. dr. C.T.B. Ahaus, Prof. dr. J. Kesicioglu, en Prof. dr. H.B.M. van der Wiel, wil ik hartelijk danken voor de vlotte beoordeling van het manuscript.

Dan de vele collega's die me gesteund en geholpen hebben tijdens dit traject en zeker in de beginfase toen alles nog bijzonder onoverzichtelijk was: drs. Dinald Maatman, Durk Dijkstra, Lars van Heerden en de kerndocenten van de IC en Acute Zorgopleidingen. Voor hun zeer waardevolle deelname aan de Delphi Rondes voor de ontwikkeling van het instrument en als coauteurs: Prof. dr. Robbert Sanderman, mw. Prof.dr. Mariet Hagedoorn, dr. Dick J.Kleijer, mw. drs. Nicole Holman en dr. Bert Loef. Voor de ontwikkeling en ondersteuning bij de interventie: Prof. dr. Jan Zijlstra, drs. Hans Delwig voor het ontwerpen van de scenario's, drs. Camiel Elsinga voor de techniek, drs. John Wiering als collega-trainer en Janny Wolterman voor de planning. Voor de ondersteuning bij de presentaties met betrekking tot de resultaten van dit onderzoek dr. Peter Boendermaker. Ook wil ik mijn broer Michel en mijn neef Reyn bedanken voor de ondersteuning van de Engelse teksten. Veel dank voor de verschillende beoordelaars van de MDO video-opnames zoals drs. Olga Peters, Ronald Brand, Hetty Kolkert, Hanneke Kruger en Wieke Terpstra en ten slotte Mieke Kapteyn voor alle regelzaken aan het eind van het traject.

Het onderzoek had uiteraard niet kunnen plaatsvinden zonder de medewerking van alle IC professionals (artsen en verpleegkundigen) en consultants van de vier Intensive Care afdelingen voor volwassen patiënten van de ICV-UMCG en van de IC van het Martini Ziekenhuis. Ik ben jullie zeer erkentelijk dat jullie toestonden dat veel MDO's werden gefilmd en beoordeeld en dat jullie bereid waren om een aantal keren een vragenlijst in te vullen. Heel veel dank hiervoor!

Verder wil ik een aantal bijzondere mensen bedanken die, hoewel niet direct betrokken bij de inhoud van dit proefschrift, toch altijd interesse hadden in de voortgang en waar ik terecht kon als ik dringend advies nodig had, Prof. dr. H.A.M.

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Kerstjens, beste Huib, Prof. dr. T.Wiggers, beste Theo, Prof. dr. L.F.M.H. de Leij, beste Lou, Prof. dr. T.S. van der Werf, beste Tjip, mw. Prof. dr. A.M. G..A. de Smet, beste Anne Marie, mw. M.H.H. Banus, beste Riekje, hartelijk dank voor alle steun in de afgelopen jaren.

Helaas ben ik stellig nog vele mensen vergeten te bedanken die in de afgelopen jaren een rol hebben gespeeld in mijn leven en tijdens het schrijven van dit proefschrift. Voor iedereen die ik vergeten ben bij naam te noemen, bied ik mijn excuses aan, hartelijk dank voor alle ondersteuning.

Het schrijven van een proefschrift in combinatie met alle drukte van een veeleisende baan en gezin is een niet geringe uitdaging gebleken. Zonder ondersteuning van familie en vrienden, op mentaal vlak en in praktische zin, lukt een dergelijke onderneming zeker niet. Mijn broers en zussen: Frans, Michel, Mirjam, Erik, Karin en Irene; en mijn schoonfamilie Jacob, Gerard, Nel, Maud, Wim Ruud en Liesbeth, veel dank voor jullie belangstelling, ondersteuning en ook voor de relativering van dit alles. Ook vriendinnen Janny en Ineke, voor het luisterend oor tijdens onze afspraken, andere vrienden en vriendinnen en de betrokken burens, veel dank.

Een prestatie leveren zoals dit proefschrift kan niet zonder stevige en liefdevolle thuisbasis. Daarom wil ik Jan, Lara en Sander hartelijk bedanken. Lieve Jan, dank je wel voor alles. Jij kon altijd weer relativiseren en constructief meedenken, waardoor tegenslagen weer betrekkelijk werden.

Lieve Lara en Sander, mijn twee kanjers. We hebben veel weekenden samen doorgebracht aan tafel in de huiskamer met onze laptops. Jullie vanwege middelbare school huiswerk en later vanwege jullie vervolgstudies, Jan vanwege administratie van je praktijk en ik vanwege dit proefschrift. Hartelijk dank voor jullie enthousiasme en liefdevolle aanmoediging!

Dit proces was geen leerproces geweest zonder jullie. Iedereen bedankt!

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## Abstracts

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## CURRICULUM VITAE

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## **CURRICULUM VITAE**

Elsbeth ten Have was born on November 21<sup>th</sup> 1962 in Delft, the Netherlands. She obtained the HAVO diploma at the Baudartius College in Zutphen in 1979. In 1980 she started the course Communication and Educational Sciences at the Noordelijke Hogeschool Leeuwarden ( NHL-university ), she graduated in 1986. Subsequently, she began the course Nursing (HBO- V) which she completed in 1994, also at the NHL University . In 1995, she took a job as a nurse at the Medical Center Leeuwarden and the University Medical Center Groningen ( UMCG ). This professional career was combined with a private business, specialized in team development and communication training in health care. In 2001 she completed the book: Communication Skills for Nurses. Between 2002 and 2011, she worked as a curriculum developer and manager of Nursing Education at the UMCG. During this period, she developed 13 courses in the field of Intensive, Cardiac and Emergency Care for adult, pediatric and neonatal patients. When lecturing communication skills in these courses, she developed and applied checklists to assess these communication and teamwork skills. These checklists were based on videotaped training sessions. Since January 2009, her professional career was expanded to include this PhD project, which integrated video recordings, team development, education, training and communication in the Intensive Care Unit. Meanwhile, in 2011, she switched from the Nursing Education Department to the Directorate of Medical Affairs where she works as a senior staff advisor in the domain of patient safety and investigations of (adverse) events, also at the UMCG. Elsbeth is married to Jan Wagenaar and has two children, Lara (1990 ) and Sander (1991).

